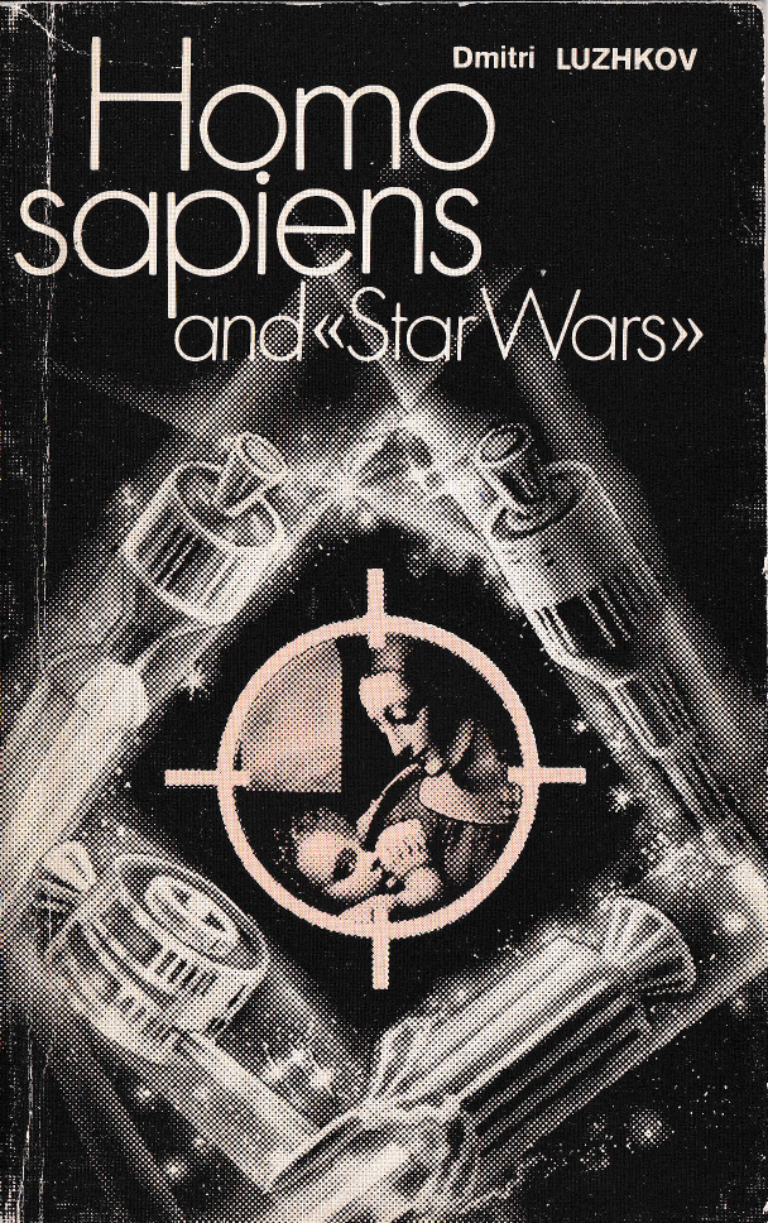
Dmitri LUZHKOV

Homo sapiens and «Star Wars»



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Those of us born some years after the end of World War II have witnessed truly miraculous achievements in science and engineering. As a boy, I used to go up to the roof of my apartment house at sunset with my friends to watch the world's first artificial satellite in orbit. Months later we were thrilled to read newspaper accounts of the flight of the first living traveller to space, a dog named Laika. Laika was followed by her "colleagues" Belka and Strelka, and the first moon probes. And then came the great day, April 12, 1961. Classes were cancelled. Complete strangers, crying and laughing, embraced each other in the streets. The white gowns of medical students were emblazoned with the slogan "Everybody Out to Space!" People were carrying the first spring flowers and posters with a photograph of Gagarin they had made themselves.

Now there are so many cosmonauts and astronauts, more than a hundred, that you can hardly remember all their names. But memories of those first space flights still make my heart leap with joy—a feeling, I think, many people my age share.

When Alan Shepard and other Americans made their flights we felt the same way, but a bit envious,

or rather, competitive. And when the Americans landed on the Moon, we were disappointed that we hadn't gotten there first. But I was very impressed by Neil Armstrong's comment, upon becoming the first man to walk on the Moon, who said something to the effect that this was one small step for a man and one huge leap for mankind.

It made me wonder: what if we all joined our efforts in the exploration of space? That this was possible was later shown by the Soyuz-Apollo *mission.*

To me and to millions of people my age those times will forever evoke exciting memories.

Unfortunately, the word "space" has now come to have both delightful and frightening connotations. And the way things are going, it may begin striking horror into us all. What started this trend was the increasingly frequent reports of American spacecraft being used for missions sponsored by the Pentagon.

Questions to Man Thinking

Throughout history there are many instances of the great achievements of human thought and making being used for destructive purposes against man. Certainly, scientists and gunsmiths have been guided by patriotism and a desire to help defend their countries in developing new weapons. But at the same time, those new weapons have been killing growing numbers of people ever more effectively.

One of the satirical characters in Bernard Shaw's play *Man and Superman* remarks, "... And I tell you that in the arts of life man invents nothing; but in the arts of death he outdoes Nature herself, and produces by chemistry and machinery all the slaughter of plague, pestilence, and famine... When he goes out to slay, he carries a marvel of mechanism that lets loose at the touch of his finger all the hidden molecular energies, and leaves the javelin, the arrow, the blowpipe of his fathers far behind. There is nothing in Man's industrial machinery but his greed and sloth: his heart is in his weapons... Man measures his strength by his destructiveness."[1]

For an optimistic playwright like Shaw, that was a rather depressing assessment, though it was

correct. It is especially apt nowadays, when there is no natural calamity comparable with the horrible weapons of destruction that man has created to his own detriment.

This state of affairs arouses unease in the academic community. British Professor Maurice Wilkins, winner of the Nobel Prize for medicine, believes that since weapons, though controlled by politicians, are based on scientific research, scientists will also bear moral responsibility if these weapons are used.

But maybe it's useless to appeal to a scientist's conscience? After all, no matter what his discovery, it subsequently becomes applied to weapons development. Professor Wilkins objects: "Science in general, I would say, has a potential for both Good and Evil. ...If you take a particular human being, he might be very evil. But generally I would say Life has a potential for Good. The same with science: it may take good forms and it may take evil forms. That will depend on the way people work with science"[2].

People are motivated by interests. There are general human interests and humanitarian interests, of which the one of saving the invaluable gift of life is paramount. There are personal and creative interests. There are class interests. And there are material and selfish interests. So what is it that guides scientists in our nuclear-missile age when they control profoundly powerful means of both protecting and destroying life on earth?

Back in 1922, Professor Vladimir Vernadsky (1863-1943), an outstanding Russian natural scientist and founder of the Radium Institute in Leningrad, made the following warning:

"The time when man will harness atomic energy is not far off. Will he be able to use that force and

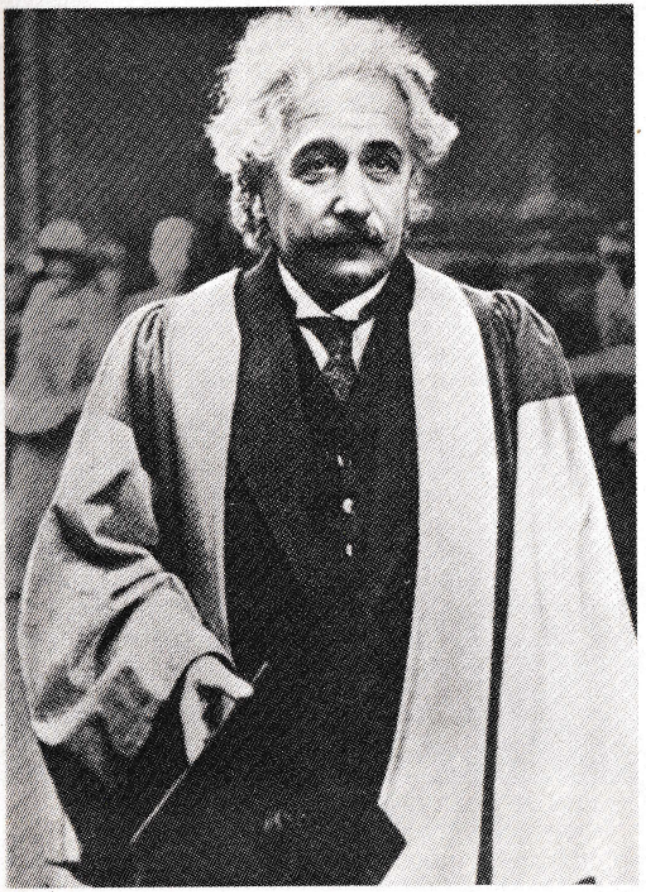
Vladimir Vernadsky

direct it towards good purposes rather than self-destruction? Is he mature enough to use the power that science will surely give him? Scientists must not turn a blind eye to the potential consequences of their research work and scientific progress. They must be responsible for the consequences of their discoveries. They must link their work with the better organisation of all of humanity."[3]

Did those who helped to develop the weapons that completely changed all conventional views about military force feel this responsibility?

Professor Joseph Rotblat was one of the group of prominent physicists working to develop the first atom bomb under the Manhattan Project , during World War II. The official explanation for the necessity of this work was the threat of the Nazi regime using such weapons. But towards the end of 1944 it became evident that the Germans had abandoned the bomb project. Why, then, was the work being continued? Professor Rotblat says that some of the scientists working on the project were motivated by scientific curiosity and the urge to establish the truth of their theoretical calculations. He recalled that they felt that they should enter into the debate about the bomb's use only after a test explosion. Others were persuaded by the argument that the bomb would save many American lives by putting an early end to the war with Japan. Still others were unwilling to take a stand, fearful that it would hurt their careers[4].

Professor Rotblat himself was firm in his decision. He left the laboratory that same year, in 1944. But the work went on. Finally there came an explosion "brighter than a thousand Suns". According to eye-witness accounts, Robert Oppenheimer, the distinguished physicist, was stunned by the sight of the first A-bomb test and



Albert Einstein (1879-1955)

somberly remarked, quoting from the sacred book of the Hindus, "I am become Death, the Shatterer of Worlds!"[5] His colleagues, Leo Szilard and James Franck, urged the State Department to prevent the bomb being used against defenceless women and children. But their appeal was ignored, and the Hiroshima and Nagasaki tragedies followed.

Einstein was shocked. He bitterly exclaimed that if he had known what the result was going to be, he would never have lifted a finger.[6]

The great scientist, realising that the next catastrophe might be even more horrible, decided to do everything in his power to prevent a repetition of the tragedy. One of the last things he did in his lifetime was to sign with Bertrand Russell a declaration known as the Russell-Einstein Manifesto on April 11, 1955 (a week before his death). This is how they put the matter: "Shall we put an end to the human race; or shall mankind renounce war?" The concluding paragraph of the Manifesto read: "In view of the fact that in any future world war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the governments of the world to realise, and to acknowledge publicly, that their purposes cannot be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them." (See Appendix 1)

Einstein pointed out that the use of the atom bomb made it quite obvious that national weapons could no longer provide a defence against aggression. There was no defence against the atom bomb, and it was useless to prepare one for an atomic war. Einstein insisted that the advent of atomic weapons made the notions of military power and technological superiority meaningless.[7]

Bertrand Russell (1872-1970)

The Russell-Einstein Manifesto caused a heated controversy among Western scientists. A group of the most prominent specialists, including participants in the Manhattan Project, supported it and many of them continue to work in this direction now.

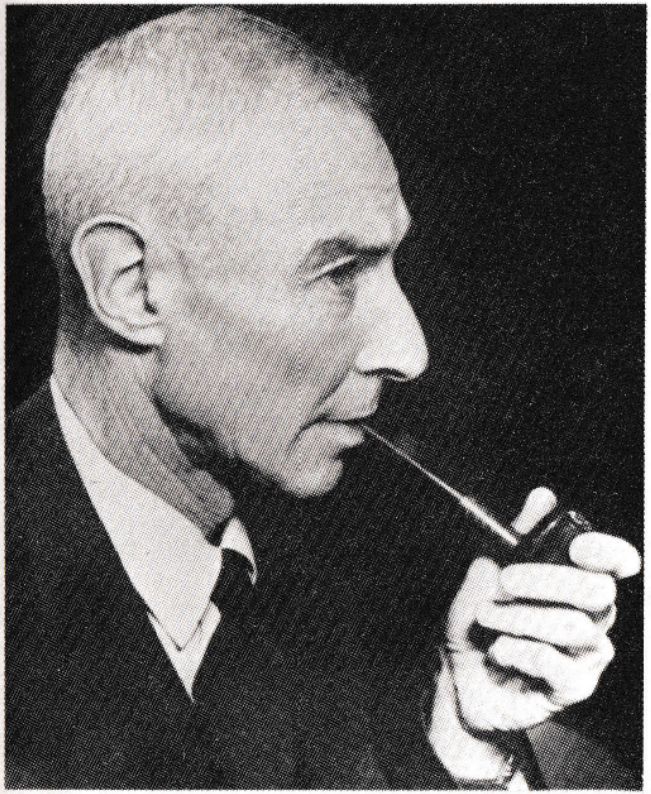
A dominant figure in the opposing camp is

Edward Teller, a contributor to the Manhattan Project and father of the H-bomb. He has drawn completely different conclusions from his life's experience. It would be such a nice thing, he says, if US scientists should work on the development of SDI with the same zeal and passion as their predecessors did on the atom bomb project.[8]

His moral principles are revealed by the following fact in his biography. In the 1950s, for instance, Teller acted as the main witness in the shameful investigation of Robert Oppenheimer's political views after his refusal to participate in the H-bomb project.

Among scientists, there are different types, having different lives and various conceptions of their duties. What they all have in common is that they work to expand human knowledge and untiringly search for Truth. In his famous speech at Cambridge on August 31, 1837, the American philosopher and essayist, Ralph Emerson, classified people according to their occupations. He described the scholar as being "the delegated intellect" who in the right state is "Man Thinking". Emerson elaborated:

"Free should the scholar be,—free and brave... It is a shame to him if his tranquillity, amid dangerous times, arise from the presumption that like children and women his is a protected class; or if he seeks a temporary peace by the diversion of his thoughts from politics or vexed questions, hiding his head like an ostrich in the flowering bushes, peeping into microscopes, and turning rhymes, as a boy whistles to keep his courage up. So is the danger a danger still; so is the fear worse... The world is his who can see through its pretension. What deafness, what stone-blind custom, what overgrown error you behold is there only by sufferance,—by



Robert Oppenheimer (1904-1967)

your sufferance. See it to be a lie, and you have already dealt it its mortal blow."[9]

Some Western scientists have had the courage to see and expose lies. Others have reconciled themselves to "stone-blind custom". This book is about both types of scientists.

How It All Began

The first missile systems were developed and tested in the West and the USSR back in the 1930s. At that time Sergei Korolyov, then a young engineer who would later become the chief designer of the first Soviet spaceships, wrote: "In the capitalist countries, where every achievement of science and engineering is primarily appraised from the viewpoint of its usability in war, the development of rocket technology for harmless purposes would hardly have attracted much government attention or funding. The intensive development of rocket technology in the past few decades has doubtless proceeded as part of preparations for war."[10]

Londoners, who experienced Nazi bombardments with V-1 and V-2 rockets, were the first victims of the new generation of weapons produced by "Man Thinking".

After the war, the United States grabbed up the brains from Germany and put them to work on its own military programmes. The foundations of missile technology in the United States were laid with the help of Nazi scientists such as Wernher von Braun, Arthur Rudolph and many others. This collaboration was strongly opposed by outstanding representatives of American academic thought, including Einstein.

The same scientists are helping to carry out the current US programme for the militarisation of outer space. Walter Dornberger, a former Nazi general, is now in charge of the aerospace systems division of the Bell Corporation in the United States. He considers the control of space for scientific, political and military purposes equally important, though he certainly prefers the latter. With the help of people like him, the United States began militarising space back in the mid-1960s when it deployed two anti-satellite systems on islands in the Pacific Ocean equipped with nuclear warheads.

In 1978 and 1979 the Soviet Union and the United States were involved in negotiations about preventing the militarisation of space. Then the United States withdrew. The reasons for this move became obvious a year later when in its 1980 platform the Republican Party called for "vigorous research and development of an effective anti-ballistic missile system".[11]

In May 1981 George Keyworth, a nuclear physicist, was appointed Science Adviser to the President. Together with Edward Teller, he persuaded the President to embark on an official course towards militarising space.

A Vision or a Stratagem?

President Reagan outlined his Strategic Defence Initiative (SDI) in a televised speech on March 23, 1983. The programme was presented as a kind of vision revealing to the President, always so preoccupied with the future of peace, the way to save the world from self-destruction in a nuclear-missile war. The President was widely quoted as saying: "What if... we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies?"[12]

The aim of SDI is to set up a defence to prevent

President Reagan announcing his Star Wars plan. March 1983.

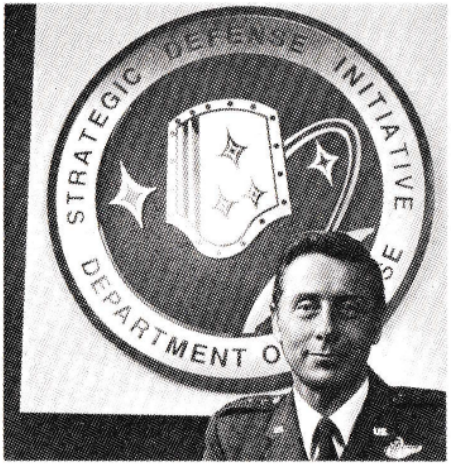
any missile or warhead from reaching the territory of the United States and other NATO countries in the event of war, by destroying them either in the launch stage, in space on their way to targets, or during the re-entry in the upper layers of the atmosphere. It is argued that such an effective defence is feasible and that it would make an attack pointless, thus rendering strategic nuclear arms impotent and obsolete.

The SDI project provides for developing space-based surveillance and attack-warning systems, deploying battle stations with laser or particle-beam guns in space (or leaving the guns on earth and deploying reflectors in space to direct the beams to their targets), and adopting new anti-satellite missiles. The plan is to combine all these components in one system and provide it with high-speed computers that would receive information from satellite radars, process it, aim the guns and anti-missiles, make the necessary commands... and foil the enemy attack. Aware of this, it is argued, the enemy would be deterred from starting an attack and the risk of nuclear war would vanish.

It is planned to carry out the necessary fundamental and applied research and development and to have the system laboratory-tested, built, adjusted and deployed within 10 to 15 years.

The President's initiative to spread the sphere of a potential military conflict to space plays on the fears of ordinary Americans of nuclear war and the "Soviet threat". Instead of cooperating with the Soviet Union in halting the nuclear arms race and reducing nuclear stockpiles, Washington resorted to the stratagem of suggesting the idea of a "nuclear umbrella" to the concerned Americans. At first, the trick worked. Opinion polls in September 1985 indicated that 45 per cent of the respondents

supported SDI as an effective defence against nuclear war.[13] This support was also the result of a whirl of activity mounted in the United States and abroad by a special agency set up to finance,



General Abrahamson, Director of SDIO

coordinate and advertise SDI efforts. It is headed by Lieutenant-General James Abrahamson and consists of six scientific and technical societies. The agency is trying to involve the nation's best specialists in the gigantic new programme which has aptly been called Star Wars.

Since the day of its announcement, SDI has provoked strong protests among the American people and all over the world. These protests are fuelled by the very scientists being wooed by General Abrahamson's agency.

Washington must have anticipated that many

researchers would reject its programme as propaganda. It was particularly concerned about universities, since in the US they account for more than half of all fundamental research and a great deal of applied research.

To enlist support for SDI, the administration produced its main trump card. This was money, a lot of money. In the first five years it is planned to spend some $26,000 million on SDI. In 1986 these appropriations totalled over $3,600 million.[14] *Time* magazine estimates that SDI could cost from $400,000 million to $1,200,000 million.[15] In the opinion of Senator William Proxmire, the cost of the project might well be over $1,000,000 million.[16] At any rate, specialists agree that SDI will cost more than all defence research in the field of missile technology conducted in the United States over the past 30 years ($40,000 million), the Manhattan Project ($15,000 million), and the space shuttle research and development ($10,000 million) taken together.[17]

Star Wars is another gold mine for arms manufacturers. Gaynor Kelley, president of a private firm in Norwalk, Connecticut, has been reported as saying: "We see SDI as a chance to generate hundreds of millions of dollars in business over the next five to ten years."[18]

The aims and interests behind SDI have been examined by the West German weekly *Der Spiegel*. US arms corporations, it said, have realised that the Star Wars programme is their future. In fact, it is a life-or-death issue for the companies controlling the arms market.

They have a stake in expanding arms production, whose growth can no longer be guaranteed by the strategy of deterrence. Since both the East and the West have between them enough armaments to

destroy the world 67 times over, it is not at all easy to persuade people that these arsenals need to grow more.

This has led industrialists to believe that the production of missiles and nuclear warheads will slacken in the next four years. The companies engaged in this business fear that without something new their profits will plummet.

This "something new" is SDI, and those who are now pushing for a strategy that moves up to the next, higher level, that is, to outer space, are looking forward to getting contracts for the next 30 years. *Der Spiegel* somberly concluded: "For Big Business, talks with the Soviet Union about SDI are more absurd than discussing the question of how to blow up Wall Street."[19]

Some 1,500 SDI-related contracts have now been awarded to businesses in practically every American state. With this kind of gravy to spread around, senators and congressmen have been elected, scientists and specialists recruited, and workers and technicians hired.

How scientists influence politics has long been a subject of debate in the West. There is a widespread opinion that they play the decisive role in the arms race. According to Herbert Marcuse's theory, out of the three forces, i.e., "the military who give commands, the politicians who provide funding, and the scientists who conduct research", the scientists are the dominant force[20]. Frank Barnaby, ex-director of the Stockholm International Peace Research Institute, takes this view: "His (the military scientist's.—*Author.*) activity alone fuels the... nuclear arms race..., destroys nuclear deterrence policy, and stimulates nuclear-war fighting ones. ...The military-technological tail wags the political dog."[21]

The political power of US weapons scientists should not be underestimated, says Paul Warnke, former chief US negotiator in the talks with the Soviet Union on limiting strategic arms. In his words, pressure from Energy Department laboratories in the late 70s "backed Carter off" of his desire to sign a comprehensive test ban treaty with the Soviet Union, which was as good as elaborated.[22]

Indeed, the Pentagon's orders are creating just as much excitement at many US universities as they are among arms manufacturers.

General Abrahamson's organisation has awarded $19 million to a consortium made up of Auburn, the Polytechnic Institute of New York, the State University of New York at Buffalo, the Texas Technological Institute, and the University of Texas at Arlington. Another $9 million grant has been provided to a group of scientists at nine universities and other research institutions, including Carnegie-Mellon, the Massachusetts Institute of Technology, and Stanford University. Professor Seymour Melman of Columbia University has said that though the Defence Department has steadily been giving grants to universities, in recent years they have more than doubled and since the Star Wars programme was announced have become particularly lavish[23]. The transfer of money for SDI research has been made much simpler.

Until recently the department in General Abrahamson's organisation concerned with scientific and technological innovations was headed by James Ionson, a former NASA astrophysicist and the chief SDI research coordinator. He has admitted: "People go where the bucks are. There is a lot of money involved here (in SDI.—*Ed.*)."[24]

At a time when quite a few US universities are

tion whether Ionson is as good an astrophysicist as he is a demagogue.

The buildings of the Massachusetts Institute of Technology (MIT) in Cambridge, near Boston, have a peaceful look and give the visitor the impression that devotion to science prevails. But looks can be deceptive. MIT's involvement in weapons development dates back to World War II when it was called "the little Pentagon".

The military-oriented Charles S. Draper Laboratories, an establishment in Cambridge maintaining close ties with MIT, from which it emerged, has contributed $250,000 to the campaign against the town being declared a nuclear-free zone. The Pentagon's annual grants to MIT have increased from $155 million to $260 million.

These injections have produced a quick response. Hanging in a MIT classroom there is a poster proclaiming: "A laser a day keeps the Russians away".[29] This would seem to be an updated version of "The Russians Are Coming".

The Defence Department's lavish hand-outs to chosen academic and research centres have resulted in their having a concentration of "warrior" scientists. Two small towns unquestionably have the lead in this respect. One is Livermore in California, where the Lawrence Livermore National Laboratory situated in a sun-scorched valley at the foot of the Sierra Nevada Mountains. The other town is Santa Fe, high in the mountains of New Mexico, the site of the Los Alamos National Laboratory. The latter was built back in World War II as part of the Manhattan Project and it still continues to develop nuclear weapons. An accelerator known as White Horse is currently under construction there, its

purpose being to produce directed particle beams. The other laboratory was set up near the sleepy Californian town of Livermore in 1952. It now has a staff of some 8,000 persons and an annual budget of $800 million.[30].

The Livermore Laboratory was founded by Edward Teller after convincing the Congress and the Pentagon that the United States needed one more nuclear laboratory. Ernest Lawrence, after whom the laboratory is now named, was its co-founder and an old friend of Teller's. A Nobel Prize winning physicist, Lawrence was quite a bellicose figure and strongly anti-Soviet. Mrs Lawrence has objected to her husband's name being affixed to this ominous establishment and has tried in vain to have it removed.[31]

Reporting from Livermore, Pierre Lellouche, a correspondent for the French magazine *Le Point*, gave this description: "A visitor to the Livermore Laboratory gets his first surprise upon approaching it. The laboratory does not at all resemble a fortified camp. There are no guards, air-defence batteries, or bunkers hidden deep underground. Following the directions of numerous road signs, you come to a turn about an hour outside of San Francisco, and there lies a rectangular patch of land encircled by a wire fence and occupying one square mile. It resembles a large construction site and is scorched by the sun almost all year round. Because of the heat and the casual life-style of Californians, the Star Warriors working on President Reagan's Strategic Defence Initiative do not wear laboratory jackets but light shirts open at the throat and tennis shoes. They look more like overgrown students than top-secret scientists. Yet, within the forbidden perimeter there is tight security. Though the Lawrence Livermore

Laboratory—the LLL—with its refectories, cyclists and young people in shorts does resemble a university campus, it is the place where most of America's nuclear devices have been created.

"Currently, the laboratories at Livermore and Los Alamos are working on the development of particle-beam weapons. A brand new experimental accelerator has been installed in a huge bunker under the Californian desert to the east of San Francisco. It emits a focussed beam of electrons moving almost at the speed of light. The installation, of course, is part of the SDI project.

"Another area of research embraces systems based on the use of an electromagnetic pulse that can put microprocessors, transistors, computers, power generators and communications systems out of operation.

"Still another body of problems being tackled at Livermore is connected with the development of microwave weapons using other properties of electromagnetic pulse that are even more destructive.

"But Livermore's real top-priority project is a nuclear-pumped laser designed to destroy missiles. It is said to be able to hit up to fifty targets at a time.

"A June 1986 visitor to Livermore said that the place was more agitated than it had been for decades. In his words, the laboratory personnel worshipped third-generation weapons, i.e., X-ray lasers. In April 1985 Nova, "the world's most powerful laser", was built there. The complex consists of two huge buildings, one, five storeys high, and the other, the length of a soccer field. Erik Storm, a physicist in charge of research at the complex, has told the press that the laser will be

used almost entirely for Star Wars research and development."

Philip Coyle, the man who leads the "omnipotent" military department at the laboratory, has boasted: "Reagan wants hard and fast results, and we'll give them to him before he leaves the White House."[32]

William Broad's book *Star Warriors*, recently published in the United States, sheds some light on "sleepy" Livermore and its athletic-looking inhabitants.[33]

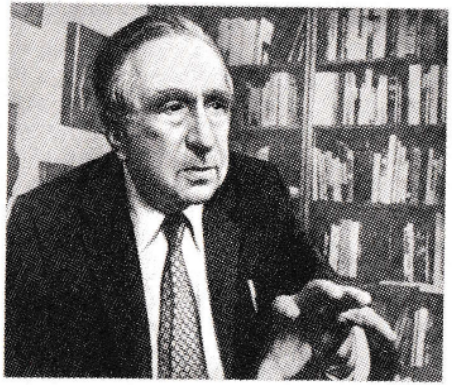
Using the material in the book and press reports, let us try to draw a group portrait of these "warrior" thinkers against the backdrop of reactors, accelerators and gamma-emitters.

80 year-old Edward Teller must certainly take a place of honour in the centre both for his merits and his age. He became Livermore's director in 1958 and worked in that capacity for many years. Though he is now ranked as a consultant, he remains the laboratory's godfather. A stout man with heavy eyebrows and a thick Hungarian accent, Teller never seems to hesitate when he is asked why he has devoted such titanic efforts to developing more and more weapons for the destruction of the human race, saying something to the effect that the Communists in Russia are more dangerous and cunning than the Nazis were in Germany.[34]

He rejects any talk about the danger of thermonuclear weapons as nonsense. Whenever he speaks in public, he claims that the arms race gives the world the only opportunity to survive and that any attempt to phase out the nuclear bomb is dangerous to the West and good for the Soviets. He is "optimistic" that if a nuclear bomb was used against a city it would kill "only half" of its popu-

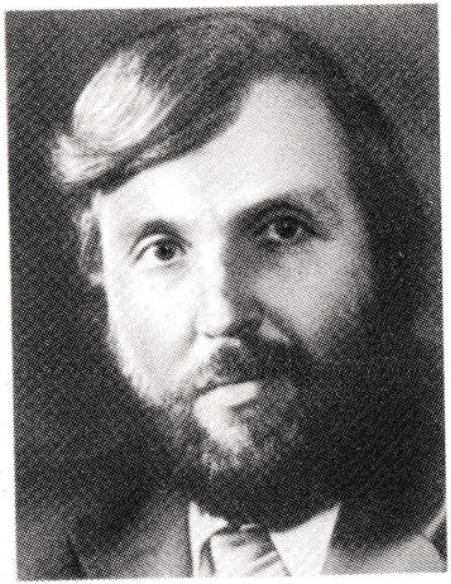
lation, including radiation victims. His most cherished piece of laboratory equipment is a laser fed by the energy of a nuclear explosion.[35]

Next to Teller should be placed 45-year-old



Edward Teller

Lowell Wood, the keeper of Teller's scientific heritage and just as ardent a supporter of the nuclear-pumped X-ray laser. Wood heads the research section known as O Group. He insists, with a kind of religious fanaticism, that this laser will save the United States. He impressed a *Newsweek* interviewer as a man who "does weapons research because he likes to see things get blown up". No less than Ionson, Wood believes that his ultimate task is to "safeguard human civilisation", but he also has an interim goal, which is "to put something up there that will *drive the Russians crazy*". He hates the Russians with a passion. Two pictures are said to hang in his office. The first, labelled "before Lowell", is a map of the Soviet Union. The other, labelled "after Lowell", is a similar-sized



Lowell Wood

map of heavily cratered desertland resembling the surface of the moon.[36]

Wood plays a big role in selecting personnel for laboratory research through the Hertz Foundation. Naturally, he picks out candidates after his own heart. But if that sort of human material is unavailable, the necessary indoctrination is done in laboratory conditions. A young scientist, thus selected, was asked why he had abandoned peaceful research to become a weapons scientist at Livermore. He replied: "It was a choice between your bomb factory and a beet cannery!"

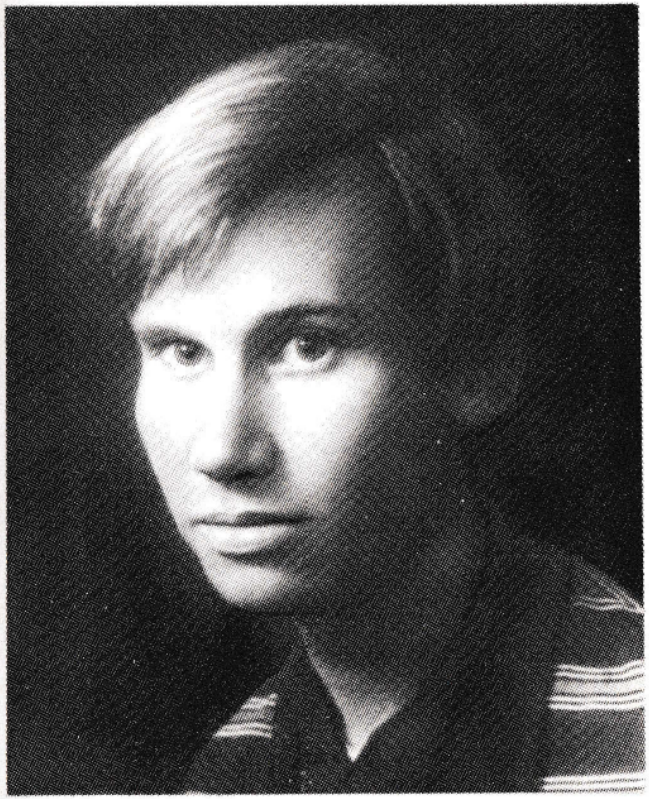
One of Wood's most promising converts was Peter Hagelstein, described in the scientific press

as one of the brightest young minds in the United States. He made his first appearance at Livermore when he was 20. Back in school he had shown a brilliant talent for mathematics, and love for Mozart and Cherubini. Wood discovered him at the Massachusetts Institute of Technology and went to work on him using all his experience as a recruiter. He told him that laboratory research would give him a unique chance to make his dream come true: Hagelstein hoped to develop a microwave X-ray laser that would be capable of detecting and killing cancerous cells in a living body. But the young man learned quite soon that that was not what he was going to be paid for. He became one of the team designing a nuclear-powered X-ray laser. When his girlfriend, Josie Stein, an anti-nuclear activist who had taken part in angry demonstrations at Livermore, learned about this, their relationship came to an end. Peter was depressed. To "cheer him up", Wood gave him *The Gulag Archipelago* by Solzhenitsyn to read. Later Hagelstein admitted that a lot of political pressure had been brought to bear on him at the laboratory.[37]

Instead of combatting cancer, he found himself working on a problem that might render all cures for all diseases completely unnecessary*.

At times, however, Broad found the Star Warriors at Livermore anything but humourless automatons. They played pranks, swapped stories and enjoyed the fun of a community resembling a big family. Many professed concern about the future of their country. Broad found their worst

* The latest reports from San Francisco indicate that Hagelstein, saying that he wanted to do research for the good of people, has left Livermore to work on an X-ray laser for medical purposes.



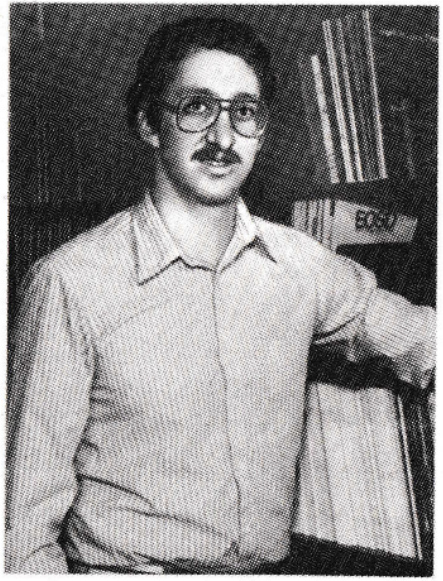
Peter Hagelstein

addictions to be the consumption of soft drinks by the case and the ingestion of large amounts of ice cream.

They did seem to believe that their work gave them power over the world. They also liked black humour. They liked to say that the bombs of

Livermore were the way to "send the very best"—a reference to a greeting-card message.

Here are some more profiles of the Livermore people.

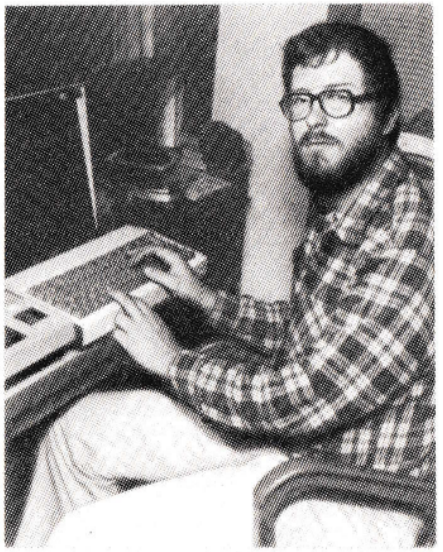


Larry West

Larry West is working on an optical supercomputer for SDI that will be invulnerable to microwave weapons. He is all for President Reagan's project. He was once quoted as saying: "I'd like to see them /the Soviet Union/ try to escalate and spend their entire budget and see their country go to ruin. I only hope that it would go that way." He reduces the meaning of Star Wars research to

seeking "technical solutions to a technical problem".

Rod Hyde came to Livermore in the summer of 1970 when he was only 19 years old. As his first



Rod Hyde

project, something of a try-out, he was given the fantastic task of designing a spaceship with a speed a thousand times faster than the achieved limit. His design caused quite a sensation at a scientific congress in New Orleans.

Rod Hyde seems to think a lot of himself and takes a rather simplistic view of the world. His hero is Alexander the Great: "He had class. He was so damn talented to do what he did at his age. He was 32 when he died, and he had conquered the

known world at the age of 26." Rod's entire talent is directed against the Soviet Union. "I don't trust the Soviets worth beans," is how he explains his working at Livermore. Broad found that nobody else joked so earnestly about rearranging Soviet society "with a few well-placed H-bombs". In general, Rod Hyde believes that a holocaust would speed up evolution, as the lower forms of life would be destroyed and the higher forms would be given more room for development.

Those are some of the Star Warriors at Livermore. Fanatic supporters of SDI, they have never seen the sky grow purple from a nuclear blast. They have never experienced a hot wave from an outburst of fire far away. They are creating nuclear arsenals and imagine the consequences of their use only by the innocuous splashes of light on oscilloscopes and computer diagrams.[38]

Perhaps, this abuse of science does quench their thirst for knowledge. But at what price to humanity?

Star Peace Supporters

The demonstrators began moving towards testing range No. 300, belonging to the Livermore nuclear research laboratory, at dawn. On August 7, 1986, what has become an annual peaceful blockade of the testing range was held to commemorate the victims of Hiroshima and Nagasaki. Josie, Hagelstein's former girlfriend, must have been there too, among the students, scientists, farmers, office workers, and unemployed. The demonstrators had gathered to voice

their protest against Washington's nuclear policy. For all their outward appearances, did the Livermore personnel really feel so self-assured as they stole their way to and from work, trying to avoid the pickets of protesting citizens? It is not easy to live with a guilty conscience.

A wire fence sealed off the range, bearing traces of nuclear explosions, from the rest of the barren Nevada desert. The guards and police surrounded casually dressed people, young and old. Among the protesters was John Mack, a Harvard University psychiatrist, a Pulitzer Prize winner and the author of the first study analysing the impact of nuclear fears on children done in the United States. His principles and devotion to science led him to join the campaign to stop nuclear testing and the development of Star Wars laser weapons. He considered it his professional and human duty. To him, SDI represents ideological extremism combined with technological achievements irresponsibly used.

John, with his wife Sally and his three adult sons, Ken, Dan and Tony, had travelled all the way from Massachusetts to participate in the demonstration at the Nevada testing range. There they were arrested. When they stepped across the forbidden white line at the fence, they threw off the bonds of fear and indifference that, in their minds, had come to signify some sort of connivance with what they considered a crime. As he returned from prison, John said that he had in a way stepped over some very important limit within himself.[39]

The eminent American astronomer, Carl Sagan, and his wife, writer Ann Druyan, have also demonstrated outside the Nevada testing range and have been arrested. Hundreds of other Americans have acted likewise.

It is obvious that the administration anticipated that at least part of the scientific community would react negatively to its Star Wars adventure. It could not ignore the fact that many representatives of American science supported the anti-war platform of Einstein and Oppenheimer. But it never expected such strong and organised opposition to SDI. In key areas of science, it failed to enlist the support of many thousands of scientists and specialists who refused to be bribed, cajoled or intimidated into backing up the project. They remained loyal to their responsibility as scientists, citizens, and human beings.

In addition to demonstrations, there have been publications in scientific journals and popular periodicals, scientific conferences and symposiums, and declarations and boycotts protesting against SDI and nuclear testing. It is said that certain leading US universities have organised opposition to the Star Wars project.

The first important condemnation of plans to militarise space was made in Europe in a statement signed by the presidents and other representatives of 36 academies of sciences from different countries, including the United States, the Soviet Union, Britain and France. The statement came out of a conference convened in the Vatican in October 1982 by the Pontifical Academy of Sciences, and in it the world's foremost scientists flatly rejected the possibility of developing effective defence systems against nuclear missiles.[40]

Opposition to SDI from universities in America began to be felt in May 1985 when it was announced that the California Institute of Technology was involved in SDI research. The CIT leaders, saying that only one of their researchers was involved with SDI, publicly accused the administration of distorting their views.

A month later, the President of the Massachusetts Institute of Technology formally announced that MIT refused to contribute to SDI development efforts. 100 scientists from the University of Illinois, including 53 professors from the Department of Physics, the second largest such department in the US, stated their refusal to be involved in the project. A similar statement boycotting SDI was signed by 112 professors and over 400 graduates of Cornell University. Later, Cornell and the University of Illinois joined the United Campuses to Prevent Nuclear War, an organisation set up back in 1982. In September 1985, at a news conference at the Massachusetts Institute of Technology, United Campuses announced a national campaign to boycott the SDI programme.

As part of the campaign, the physicists of Princeton University issued an appeal, part of which noted that the prestige of the leading universities was being exploited in order to "sell" the programme to Congress. They pledged not to ask for and not to receive SDI appropriations, and urged other scientists to do the same.

All SDI opponents doubt the technological feasibility of a space defence system. They fear that the project will impair existing arms control agreements and the prospects for disarmament, and entail new economic hardships.[41]

The personnel of the Brookhaven National Laboratory in Long Island, New York, have refused a $ 4 million Star Wars contract.

The protest movement has spread like wildfire to engulf the University of Texas, the University of Chicago, the University of Pennsylvania, the University of Colorado, Columbia University,

Hans Bethe

Syracuse University, Purdue University in Indiana, and even such a "remote" seat of learning as Utah State University.

In September 1985, over 300 noted American scientists of at least 31 universities were reported to have pledged not to get involved in SDI.[42]

In October 1985, more than 1,300 leading university scientists in the United States refused offers of SDI funding. Petitions to this effect were signed by 65 per cent of the physicists employed at the leading universities, including the Nobel Prize winners Hans Bethe, Edward Purcell, James Cronin, Sheldon Glashow, Val Fitch, Steven Weinberg, Subrahmanyan Chandrasekhar, and Owen Chamberlain.[43]

In this context, *Time* magazine pointed out that at many universities Star Wars had produced echoes of the 1960s protests against campus military research. This time, however, the dissension was led not by radical leftist undergraduates, but by professors and graduate students.[44]

By late October 1985, over 90 colleges and universities in the United States and about 3,000 scientists, engineers and other personnel had joined the anti-SDI campaign.[45]

In May 1986, 92 per cent of the members of the National Academy of Sciences in the United States spoke out against SDI.[46]

That same month a news conference in the Congress building was told that over 6,500 American scientists and specialists, including 15 Nobel Prize winners, had refused to develop space strike weapons under the Star Wars programme.[47]

By November 1986, their number had grown to 7,000, including 57 per cent of the physicists employed at 20 major universities in the United States.[48]

Sidney Drell

At about the same time, at the request of the Union of Concerned Scientists, the Peter D. Hart Research Associates polled members of the American Physical Society, which has a membership of over 37,000. Most of those polled were quite familiar with the problems of SDI. Asked if the United States was doing the right thing in

developing the SDI programme, 54 per cent of the respondents gave a firm "no" (29 per cent said "yes"). Although 77 per cent (vs. 21 per cent) supported continued laboratory research under the programme, 62 per cent of the physicists objected to the deployment of SDI components. In the opinion of 67 per cent of those polled, SDI could not defend the country, and 52 per cent were convinced that it could not provide adequate protection for even part of US territory.

According to the journal *New Scientist*, US scientists see SDI money as a bribe to lure them from other, more profitable fields in space studies and advanced technology research.[49] Not surprisingly, many of the 7,000 scientists who have refused to take SDI money—and a lot of money at that—are leading specialists in fields that are directly related to national defence. In addition to the persons already named, they are Charles Townes, George Rathjens, Isaac Rabi, James Van Allen, Lee Alvin Du Bridge, Herbert York, Richard Garwin, Sidney Drell, and Victor Weisskopf. Many of them are Nobel Prize winners, Manhattan Project veterans, Congressional consultants, and advisers to previous administrations, that is, the cream of American science.

Will their boycott have any influence on the Pentagon's plans? One science observer has answered this question by saying that physics, the key discipline for missile defence, is like baseball: there are many players but only one or two stars. The military badly need these scientific stars, if they are to make headway. Simply put, without the stars of science there can be no Star Wars.[50]

The American scientists' campaign for peace on earth and in space is not confined to boycotts and other protests. They are playing a highly important

role in the international campaign of scientists to expose the SDI rationale for what it is: pseudo-science and propaganda. The SDI advertisers have already achieved a lot, as shown by the millions of Americans who have believed President Reagan. According to the *Los Angeles Times*, the President's idea "has immense popular appeal".[51]

True scientists—physicists, mathematicians, chemists, computer experts and specialists in other fields—realise better than anybody else what SDI is all about. They know all too well how much it will cost and what disastrous consequences it might have, namely, the destruction of all life on earth. For this reason they see the task of exposing the big lie about SDI as their sacred duty.

SDI: Legends, Facts and the Truth

A coalition in support of SDI has produced a three-minute cartoon showing an American family in their idyllic home, with the children playing about in the garden. Suddenly, "enemy" missiles appear in the sky. As if by magic, a protective rainbow called SDI forms, destroying all the missiles. As the sun shines on and the birds keep singing, the children ask their mothers and fathers to spare no money for their "self-defence". This cartoon has been shown a lot on television.

The arguments of the SDI advertisers, though false, are quite sophisticated and even have a scientific ring to them. One such argument, for instance, calls SDI an ideal form of arms control, an

equivalent of a nuclear freeze, and insists that it accords with the moral principles of the United States and the demands of its constitution.[52]

The most widespread argument for SDI, initiated by President Reagan himself on March 23, 1983, claims that SDI is defensive only and will render nuclear missiles "impotent and obsolete".

Several groups of experts were formed in the United States soon after the President delivered his speech "to determine the technical feasibility and the strategic implications of pursuing Reagan's long-term goal of putting an end to the threat of ballistic missiles". Two such groups, set up by the Defence Department, could only express "cautious optimism" about reaching the stated objective.[53]

The Union of Concerned Scientists established an expert group of its own, consisting of Manhattan Project veterans, the Nobel Prize winning physicist Hans Bethe, and a member of the team that had built the first H-bomb, Richard Garwin. The group challenged the possibility of building "a thoroughly reliable and total" defence to protect the population as well as weapon sites.[54]

Another feasibility study was published in May 1984, this time by the Congressional Office of Technology Assessment (OTA), which, as it is a non-partisan body acting independently of the government, has the reputation of being an impartial judge. The report called "the technical prognosis that the Strategic Defence Initiative would provide a perfect or near-perfect defence 'extremely pessimistic'" and expressed doubts "about the success of a US space-based anti-ballistic missile system".[55] At the head of the OTA expert group was physicist Ashton Carter of the MIT Centre for International Studies.

In June 1985, *Newsweek* magazine reported:

"Privately, even scientists involved in SDI research say that the 1983 Reagan speech misled the American public by suggesting that a leakproof anti-missile umbrella—sometimes known as the 'astrodome defence'—can ever be built. And with tens of thousands of warheads raining down on the United States, even a small leak would lead to destruction of the 'soft targets'—that is, human beings."[56]

This aspect was thoroughly examined by noted scientists of the German Democratic Republic in the weekly *Horizont*. Professor Robert Knuth, Director of the Institute for Space Research at the GDR Academy of Sciences, said that the idea of "a leakproof shield" was as absurd as that of "perpetual motion". Even if, by some fantastic efforts such a "shield" is made 99-per-cent leakproof, out of 1,000 intercontinental ballistic missiles, 10 would still get through and deliver their 100 nuclear warheads to targets, causing blasts 5,000 times more powerful than the Hiroshima explosion. Certainly, this would be a disaster.[57]

In the United States itself, 98 per cent of the members of the National Academy of Sciences consider it impossible to build an effective defence against nuclear attack.[58]

With President Reagan's key argument coming under so much criticism, the Star Warriors have had to manoeuvre and backpedal. Edward Teller, for whom SDI is "a life-or-death issue", has tried to evade the awkward questions with a question of his own: Can disarmament with the Russians give America a 100-per-cent guarantee?[59]

Later, taking another step backwards, he admitted that he did not personally believe that SDI would be totally invulnerable or that such a shield could be built in the foreseeable future. Therefore,

he argued, parallel to SDI, it was necessary to build up and modernise the nuclear potential. Speaking in Paris, he described the SDI idea of abolishing nuclear arms on earth as a fairy-tale invented for domestic consumption in the United States in order to deal a blow to the anti-war movement and force it to put up with the project.[60]

Now what about President Reagan's main argument that SDI was intended for defence? His aides began to "explain" what the President had meant to say. George Keyworth, President Reagan's science adviser, said that, as one of those who wrote this speech, he should know for sure that its subsequent interpretation was completely wrong. The stated goal, he argued, was to render missiles and, ultimately, all nuclear weapons "impotent and obsolete". Therefore, one must be, to say the least, silly and ignorant to take this as a promise of a foolproof defence.[61]

This seemed to refer to some of the stars of American science of the first magnitude, and there was no way that Keyworth could possibly get away with it. He was publicly criticised by physicist Jeremy Stone, Executive Director of the Federation of American Scientists, who said: "Keyworth is supposed to be the President's science adviser, the title is not 'presidential science flak'."[62] Shortly after that Keyworth was removed from his position.

With their backs to the wall, the SDI advocates got lost in their own schemings and began to reveal the true aims behind SDI—to keep retaliatory forces intact (in the words of Robert Jastrow) and to modernise the nuclear potential (according to Edward Teller). These goals were totally different from the professed ones of building "a leakproof umbrella" over the country and

making nuclear weapons "obsolete". In the meantime, propaganda continued to insist that SDI was intended as a "defence" against "Soviet nuclear aggression". This was the next target of criticism from the scientific community.

Writing in the journal *Scientific American*, Hans Bethe, Henry Kendall, Richard Garwin and Kurt Gottfried clearly showed that space weapons would be unable to deflect a massive strategic-missile attack, but might prove an effective means of neutralising a weakened response to a first strike.[63]

This opinion was substantiated by Professor George Rathjens of the Massachusetts Institute of Technology when he wrote: "However effective a defence system might be in coping with a massive attack, it would be far more effective in dealing with a ragged response by an adversary whose missile forces had been the subject of a disarming attack, a 'first strike'. Each side, knowing this, would see its adversary's deployment of a ballistic missile defense as very threatening, and if there were actual deployment by both sides, there would be a reciprocally reinforcing impetus to strike first."[64]

Meanwhile, SDI people continue to invent new arguments to prove that the project would promote world peace and reduce the risk of nuclear war. Robert McGrory, Director of the Laboratory for Laser Energetics at the University of Rochester, has said: "We could offer to share our technology for stability and tie that to an arms builddown."[65] On the other side of the Atlantic, Professor Bulkley of the University of Bradford in England, an expert on strategic problems, takes a different view of SDI. He believes that it is designed to play a twofold role, that is, to destroy the enemy's military satellites in the process of protecting one's own and thereby gain advantages for military action; and secondly, to divert a retaliatory ballistic-missile strike from one's territory. Needless to say, neither of these aims has anything in common with the need to remove the threat of nuclear war.[66]

In the opinion of Frank von Hippel, professor of physics at Princeton University (his grandfather, incidentally, was an associate of Rutherford and Einstein, and one of Teller's teachers), SDI is a scientific fake intended to meet a social contract. From the point of view of science, the hullabaloo over a nuclear shield is nothing but a bluff. It is a dream about achieving superiority and first-strike capability dressed up as concern for humanity.[67]

Writing in the *Los Angeles Times*, Thomas Powers, a noted expert, had this to say about Star Wars: "The purpose is not to keep the Soviets from threatening us, but to make sure we can threaten them."[68] There has been a lot of talk in the same vein by some of the Star Warriors themselves. John Rather, a specialist in space-based lasers and an ardent supporter of SDI, once let it drop that a fleet of battle stations in space could be used to strike at certain targets in space, in the atmosphere and on earth.[69] John Gardner, a department head at the Strategic Defence Initiative Organisation, told a closed conference of the American Society of Mechanical Engineers that SDI would dramatically change the nuclear balance in the United States' favour.[70]

This takes us close to the true meaning of President Reagan's "initiative". The Soviet Union, against whom SDI is aimed, has understood its real significance from the very beginning. It is not, as the West claims, that we are too suspicious. We are only being guided by the facts. The Soviet Union

well remembers that the United States has drawn up numerous plans for nuclear attack against this country, including Dropshot, Pincher, Offtackle and many others. Back in the 1950s, it encircled the USSR with bases from which nuclear-capable bombers could take off for attack. This was an attempt to bring the Soviet Union to its knees from the sky. Now the United States is planning to do the same from space.

A Soviet authority in this field, Academician Vsevolod Avduyevsky, has this to say: "The US military hopes that by using space-strike weapons it will be able to terrorise the people of all countries and dictate its will to them."[71] Serious scientists both in the East and the West realise that these hopes are vain.

Henry Kendall, Chairman of the Union of Concerned Scientists, believes that the Soviet Union has every reason to be concerned about its security and is certain to take counter-measures. A collective study prepared by members of the Union, including Hans Bethe, Hermann Panofsky, Herbert York and Jerome Wiesner, says that it is impossible to establish a comprehensive anti-missile defence. At the same time the Soviet Union will regard these attempts as a threat to itself that is not to be tolerated.[72] Numerous specialists feel that if these incredibly costly weapons should appear, many counter-means will be developed immediately. According to Dr. Werner Fuss, a laser researcher at the Max Planck Institute of Quantum Optics, these means will be fairly inexpensive. Huge, highly sensitive precision mirrors are to help focus laser beams on their targets. All that would have to be done to put these mirrors out of commission would be to orbit a charge of sand in a head-on course with them.[73]

Possible counter-measures against space-strike weapons were examined in an October 1985 report by the Committee of Soviet Scientists for Peace, Against the Nuclear Threat. The report said that a large-scale anti-missile system could be neutralised by such means as small missiles of various basing modes, "space mines", or high-powered lasers. There would be no need at all to destroy the entire space-based ABM system. It would be enough to weaken it by striking at its most vulnerable components, i.e., to "breach" the shield in order to retain the capacity to strike back in a way that the aggressor would find unacceptable. The report named other potential responses to SDI, including an increase in the number of ICBMs and so-called decoys, or of ballistic-missile warheads, and the mass-scale deployment of cruise missiles of various basing modes or other weapons that it would be absolutely impossible to neutralise.[74]

Needless to say, such counter-measures would place additional strains on the Soviet budget. But as *Newsweek* magazine pointed out on June 17, 1985, "There is little doubt that a full-fledged Star Wars shield would by itself dwarf the current federal budget of $1.8 trillion, but the crucial question is: will the counter-measures be cheaper for the other side? If it turns out that counter-measures cost less, the system will be doomed." The magazine based this conclusion on the remark of Richard Garwin that it is much easier to break a sophisticated clock than to put it together, similarly, it is much easier and less expensive to destroy any system than to build it. Can there be any doubt, really, that the Soviet Union is capable of taking those counter-measures?

In August 1986, Marshal Sergei Akhromeyev,

First Deputy Defence Minister of the USSR, told a news conference in Moscow that if the Star Wars plans were carried out, the Soviet Union would take counter-measures that would devalue the programme. Noting that the United States did not have a monopoly on scientific and technological progress in the military field, Marshal Akhromeyev said that the Soviet Union was conducting fundamental research in many areas, including those that quite clearly suggest effective counter-measures. If the US administration goes ahead with its plans, he concluded, the Soviet Union will choose a course of action that will meet its defence interests in the best possible way, which, in turn, will place before the United States the need to search for a reply.[75]

Herbert York, a weapons specialist and ex-director of the Lawrence Livermore National Laboratory, agrees: "We will have varying degrees of defence, and one side or the other may be slightly ahead... But we will never have a world in which one side is safe and the other isn't."[76]

Academician Andrei Sakharov's attitude to SDI came as an unpleasant surprise to the American administration. At a news conference held as part of the Forum "For a Nuclear-Free World, for the Survival of Humanity", in which he took part as one of the Soviet representatives in February 1987, Academician Sakharov said that SDI could be effectively neutralised simply by increasing the number of high-yield warheads. An assymetrical response to SDI, i.e., the predominant build-up of attack forces and destructive weapons, would make the programme utterly useless. This alone, said Academician Sakharov, turned SDI into a kind of Maginot Line in space, a costly but ineffectual project.

He added that the concentration of research forces and new technology within the project might produce sideline effects in the civilian and military fields, but these considerations were of secondary importance in comparison with the unbearably huge cost of the SDI project and its negative impact on strategic stability and nuclear disarmament.

"SDI supporters in the United States," said Academician Sakharov, "must hope to ruin the USSR economically with the help of the SDI-generated arms race. But this policy is ineffective and extremely dangerous to international stability." In his opinion, it was wrong to assert that SDI had forced the Soviet Union into disarmament negotiations. It has only made these negotiations more difficult.

There is another aspect to the problem. Some SDI supporters envision using the advantages of a first strike and then riding out the storm under cover of a "space shield" in underground shelters. But in the opinion of the foremost scientists, such a step would be suicidal. The ecological, biological and genetic consequences of nuclear war would be disastrous for the whole world. Dr. Robert Bowman, Research Director of the Washington-based Institute for Space and Security Studies, pointing to this mortal danger posed by SDI, has suggested that the programme should be called "star death".[77]

Fissionable materials are now being used by many countries. Even without a massive nuclear strike, such a country as the Federal Republic of Germany, for instance, could suffer widespread, if not total ruin. All that has to happen is for a conventional shell or bomb to hit a reactor at any of the nuclear power stations on that country's

territory. The escaping radioactivity would prove lethal to people on a huge territory.[78] The accident at Chernobyl, though far less tragic, has graphically shown that nuclear power engineering must be handled with the utmost care and that nuclear power, if not controlled, can be tremendously dangerous. There are 101 nuclear power stations and 93 nuclear reactors in the United States. There is no way that SDI could possibly protect the American people if deadly radiation were to leak from any one of them. The same holds true as concerns the Soviet Union and other countries, including those not having nuclear power stations or research reactors on their territories.

Furthermore, Soviet and American scientists have discovered what is called the "nuclear winter" effect. A 1984 issue of the *Scientific American* magazine carried an article jointly written by Carl Sagan, R. P. Turco, O. B. Toon, T. P. Ackermann, and J. B. Pollack. On the basis of a thorough scientific analysis of the available data, they concluded that in the event of nuclear war, smoke and dust would rise high into the atmosphere, blocking out the sun and plunging the planet into freezing darkness. Nobody would survive a "nuclear winter"—neither the aggressor, nor the victims of the aggression, nor third countries. The human race would perish.

Some time later, a group of Soviet scientists led by Academician N. Moiseyev made similar findings after developing a mathematical model of the climatic consequences of a nuclear exchange.

These findings aroused general anxiety and dealt a blow to SDI. When it became clear that the "nuclear winter" theory could be neither overlooked nor denied out of hand, President Reagan ordered a special research group to be set up to

reconsider the problem. But the group found the ominous conclusions to be correct. A big scandal was in the air, but once again the Livermore specialists came to the aid of the White House and the Pentagon. This was not only a matter of professional honour. It was a matter of survival for many of the laboratory staff, for the "nuclear winter" theory threatened to "freeze them out" of their jobs. So, because apparently for them their own survival was more important than that of the human race, they tried their very best.

The new Livermore "theory" claims that the temperature would only plummet by 25 degrees below normal rather than by 45 and that therefore a "nuclear winter" was unlikely to happen. If a nuclear war was fought in summer, the temperature decrease would be less dangerous. Though the ensuing cold would adversely affect crops, it would not destroy the ecological system on earth. It would only be chilly—like autumn in the United States.[79]

This scientific dishonesty and utter cynicism on the part of the Livermore "warriors" shook the scientific community. Does the world have to be turned into a piece of ice before people begin to worry about what is going on? Many are now asking this question.

Excalibur Against a Nuclear Moratorium

In the summer of 1985 President Reagan, speaking at a meeting with specialists opposed to Star Wars, claimed that SDI was research into a non-nuclear defence against a nuclear attack.[80]

However, his attempts to convince them were in vain. At a news conference immediately following their White House meeting with the President, the experts criticised the government for trying to mis-

Caspar Weinberger, US Secretary of Defence until November 1987

lead the American people with its talk about a "non-nuclear anti-missile defence".

Shortly before that, it was reported that the administration intended to deploy non-nuclear weapons in space as part of the SDI project that would be powered by the energy of a nuclear explosion. This explains Washington's refusal to

negotiate a comprehensive nuclear test ban, even though the Soviet Union has shown that it was seriously interested in signing this kind of treaty.[81] (From 1977 to 1982 the Soviet Union, the United States and Britain held talks on this issue and succeeded in solving all the chief problems involved in signing such a treaty.)

Subsequent reports confirmed that the Star Wars research had a nuclear aspect. In August 1985 the Japanese newspaper *Yomiuri Shimbun* reported that a special tunnel had been built at the Nevada testing range to conduct experiments with combat lasers pumped by the energy of a nuclear blast.

Later, Eugene Carroll, Deputy Director of the Centre for Defence Information, declared that the United States was carrying on a wide-scale programme of nuclear tests to develop X-ray laser weapons using nuclear energy. The work was being funded out of the SDI budget. Eugene Carroll said that the priority importance being given to the programme (codenamed Excalibur*) by the United States was one of the main reasons behind its refusal to negotiate a nuclear test ban.[82]

As for such Star Warriors as Donald Kerr, Director of the Los Alamos National Laboratory, he is openly saying that a nuclear test ban or freeze may have negative effects on national security. As long as the United States depends on nuclear weapons, they must be tested, as there is no other way to make a model of all the effects of new nuclear weapons.[83]

On July 29, 1985, a highly important statement was made in Moscow. Mikhail Gorbachev, General

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* Excalibur was the all-powerful sword of King Arthur of England.—*Ed.*

Secretary of the CPSU Central Committee, announced the Soviet Union's decision to stop all nuclear explosions unilaterally on August 6, 1985, the 40th anniversary of the atomic bombings of Hiroshima and Nagasaki. The decision received a very positive response from all over the world, including from most scientists in the United States and other Western countries. This was not surprising, as a test ban has been the main slogan of all anti-nuclear peace movements since the Russell-Einstein Manifesto.

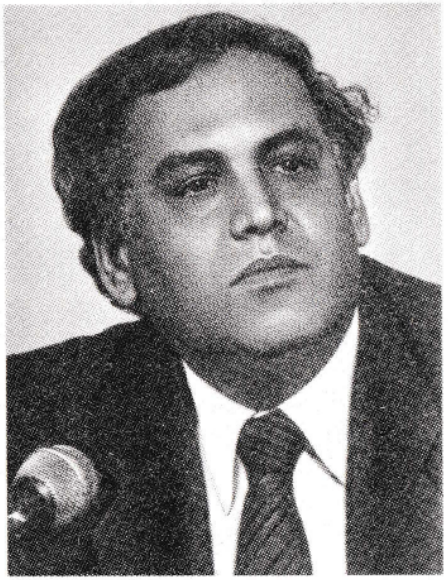
A comprehensive nuclear test freeze would provide the opportunity of reversing the arms race. It would be in the interests of US security. Conn Nugent, Executive Secretary of the International Physicians for the Prevention of Nuclear War, believes that if the United States reciprocated the Soviet moratorium the development of new-generation nuclear warheads, including those intended for space weapons, would be slowed down.[84]

The Soviet moratorium was highly appreciated by Professor Gerald Wald of Harvard University who has merited the Nobel Prize for his research in biology. He said that the United States should follow suit.[85]

The Soviet example and the scientific arguments have led many American lawmakers to campaign for an end to testing in the United States and for a resumption of the relevant talks with the Soviet Union. A worried administration was prompt to react. On September 18, 1985, Assistant Secretary of Defence Richard Perle, a diehard "hawk", spoke at hearings in the House Armed Services Committee.

Saying that a nuclear freeze or a total nuclear test ban were only slogans that looked better on T-

shirts than as part of a serious national strategy, he rejected the recommendations of top specialists. He repeated the hackneyed claim that a test ban treaty would be unverifiable. Perle said that he did



Richard Perle

not have the least doubt that the USSR would gladly agree to signing a total nuclear test ban treaty, but that the United States would be alone in honouring it, while the Soviet Union would continue testing secretly, without the United States being able to detect it with certainty.[86] Similar claims have been made by other administration officials.

American and Soviet seismologists recording the quiet of the Soviet nuclear testing range near Semipalatinsk. In the background: James Brune, Evgeny Sutulov, Keith Priestley and Paul Bodin.

The White House position came under fire from all over the world, especially from experts. Scientists have proved that modern technical means make it possible to detect any nuclear explosion no matter where or how it is carried out. Back in October 1982, writing in the prestigeous *Scientific American* journal, Dr. Jack Evernden, head of the Earthquake Engineering Research Centre in the United States, and Professor Lynn Sykes of Columbia University, reviewed the 20-year performance of the American network monitoring nuclear tests in the Soviet Union. They wrote that the 15-station network lying outside the Soviet Union could detect even one-kiloton underground nuclear explosions in any part of the USSR with 90-per-cent accuracy.

They were sure that existing seismic equipment was quite enough to monitor agreements in this field. On the basis of their research, they were convinced that the Soviet Union had never violated agreements currently in effect and continued strictly abiding by them. That being so, the two scientists ventured the opinion that problems involved in negotiating a comprehensive test ban treaty were not of a scientific but of a purely political nature.[87]

Since August 1985 the Soviet Union has extended its unilateral moratorium several times, and as many times the US administration has refused to cooperate and has accompanied each of its refusals with a series of demonstrative blasts at the Nevada testing range. The reasons? One was named by George Miller of the US Energy Department, when he said: "Nuclear testing is necessary for the morale of young weapons designers who would quit if there were a moratorium."[88] Oh, those poor Excalibur makers in

Mikhail Gorbachev on SDI: "The whole of civilisation would become technology's hostage."

Livermore and Los Alamos. A moratorium would make them redundant.

A more serious reason has been given by John Hopkins and Robert Selden of the Los Alamos laboratory, which is developing kinetic and particle-beam weapons using the energy of nuclear

explosions. The development of these new systems, they say, will take a long time and require at least 100 or 200 explosions. Adrian DeWind, Chairman of the Natural Resources Defence Council, agrees with this assessment.[89]

In the opinion of Dr. Jerome Wiesner of the Union of Concerned Scientists, the White House is preoccupied with speeding up the development of new types of weapons, like an X-ray laser with nuclear pumping, not with ending the arms race.[90]

It continues to refer to verification as the main problem standing in the way of a test ban.

Under these circumstances, Soviet and American scientists made an important new step. On May 28, 1986, the USSR Academy of Sciences and an American non-governmental organisation—the Natural Resources Defence Council—signed an agreement in Moscow to set up seismic monitoring stations near the Soviet testing range at Semipalatinsk with the participation of American experts, and near the Nevada testing range with the participation of Soviet experts. The Soviet programme is led by Academician Velikhov, Corresponding Member Nersesov and Professor Gokhberg, and the American programme, by Dr. Thomas Cochran, Dr. Charles Archenbow and Dr. James Brune. The Americans have come to Kazakhstan, installed their equipment and begun research.[91] Thereby, the "intractable" problem of on-site inspection in the USSR was solved.

Was the road to agreement now open? Not at all. The American authorities continued their sabotage. They now claim that before it announced the moratorium, the Soviet Union had carried out more tests than the United States and, therefore, is less interested in testing. This is not true. Daniel Greenberg, editor of the *Science & Government Report* magazine, has acknowledged that from the beginning of the nuclear age to 1984 the United States carried out 200 more nuclear tests than the Soviet Union.[92]

This count was made in August 1985. After one year of the Soviet moratorium, i.e., by August 1986, the United States had detonated another 18 nuclear devices. Three of these tests were unannounced, but were detected by Soviet seismic

equipment—further proof of the high effectiveness of the seismic method of verification.

With its back to the wall, the US administration has resorted to its last argument. It insists that as long as nuclear arms remain the basis of American security, testing must continue. This despite the fact that on January 15, 1986, the Soviet Union proposed a programme for phased and verifiable nuclear disarmament, which was later made concrete at the talks in Reykjavik. But the White House refused to take practical steps towards nuclear disarmament at the time.

SDI stood in the way of a unique opportunity—that of ridding the world of the nuclear nightmare—when it presented itself at the Gorbachev-Reagan meeting at Reykjavik.

In this respect, interesting comments were made in *The New York Times* in January 1987 by Professor Norman Cousins, former editor of the magazine *Saturday Review*.

Professor Cousins recalled that when Reagan first came up with his initiative, he advertised it as a peaceful and purely "defensive" project. But his administration was now asserting that it had evidence that the Russians had perceived the devastating offensive capabilities of Star Wars and that America had no choice except to proceed with SDI lest the Russians get there first.

Hence, Professor Cousins thought it reasonable to ask three questions.

First, didn't President Reagan know from the very beginning that SDI was potentially the most devastating offensive weapon in the entire arsenal of warfare?

Second, why is the United States so sure that any military hardware it can make is beyond the military capability of the Russians?

Third, if Star Wars in the hands of the Russians represents a grave threat to United States security, why didn't the President take advantage of the opportunity offered at the Reykjavik summit to bring a halt to SDI?

Professor Cousins said that each of these three questions had a bearing on the security of the American people, which has been jeopardised not only by the runaway arms race, but also by the prodigious strain on the US economy.

Professor Cousins wrote further that in reporting on the Reykjavik summit, George Shultz said that America could have had a comprehensive agreement if it had been willing to include Star Wars in the arms control package. The President claimed credit for his unwillingness to put SDI on the bargaining table in Iceland. A few months earlier, however, he had asked for Congressional authorisation to proceed with Star Wars, arguing that he needed it as a bargaining chip at the forthcoming negotiations.

Did the President believe that the American people had lost their memory, wondered Professor Cousins? Or did his statements come off the same spool as his contradictory assertions about the Iran-contra episode? Were government statements to be regarded as a way of skirting the facts?

Professor Cousins concluded by saying: "More and more, it appears that President Eisenhower was correct. The weapons merchants have a strong hold on US policy. They have an open channel to the US Treasury and have no intention of letting go." Shall we all fall into despair? Are the persistent efforts of the Soviet Union and other forces, including scientists, for peace all in vain? The answer is no.

In the first place, these efforts have stripped the militaristic ambitions of the US administration of their lies and demagogy. Professor John Kogut of the University of Illinois believes that as a result of Reykjavik protests against SDI will engulf the whole world.[93] Secondly, pressure on the US Congress has increased, and it has now adopted resolutions urging the President to resume talks with the Soviet Union on a total nuclear test ban. It is also drafting proposals to reduce the test budget. This is a significant factor.

Finally, and most importantly, the peace efforts are clearing the way for a new thinking and exposing lies, of which there are many. More than half of all Americans are oblivious of the fact that the United States was the first country to use nuclear arms. They know nothing about such an important step for peace as the unilateral Soviet moratorium on nuclear testing.

And this does not only apply to average Americans. Academician Velikhov has said that he knows a lot of top Western scientists who also were unaware of the Soviet moratorium.[94]

Given such a situation, it is very important and highly commendable that researchers are conducting anti-war education in the mass media, the scientific press and at conferences.

"The Whole of Civilisation Would Become Technology's Hostage"

Scientists throughout the world are particularly concerned over the role Star Wars will assign to that great discovery of our age—computers. As the "brain" of a would-be ABM defence, the

SDI people hope to develop ultra-modern computer systems capable of instantly detecting a missile attack and issuing commands to repel it. To this end, the Pentagon has set up a special group to work out computer programmes and has awarded contracts for this to such of its major arms contractors as McDonnell Douglas and IBM.[95]

Dr. G. Thompson, a leading expert in artificial intelligence at the University of Edinburgh in Britain, is convinced that it is impossible, in principle, either to invent, build or test such a computer system. There is no chance of a computer of that level of sophistication functioning flawlessly.[96]

Software is the main problem. So far it has been impossible to provide software that will absolutely win a game of chess, let alone a global military conflict.

Furthermore, there is no way to ensure the reliability of such a system. Professor David Parnas, a US computer scientist and a former member of the Panel on Computing in Support of Battle Management at General Abrahamson's agency, has given the following example. When IBM developed basic programmes for its computer 370, it found as many as 5,000 errors in them. This was no surprise to computer scientists, who, according to Professor Parnas, know very well that "no large-scale software system has ever been installed without extensive testing under realistic conditions."[97]

Now what kind of "realistic conditions" could there be with regard to SDI? Only one kind—nuclear war. There is no other way to test the SDI computers.

Professor Parnas, finding the project too dangerous, resigned from his position in June 1985.

Let us imagine that there are arms systems deployed in space and that a spaceship has exploded in orbit. How can it be determined whether the blast was due to a mechanical failure on board or whether the spacecraft had been hit by an anti-satellite missile? There is no time for an investigation because the computers have reacted immediately. They make only one command, that of activating the space-based weapons. This is only one of the possible scenarios that could result in nuclear war, according to Dr. Robert Bowman, Research Director of the Washington-based Institute for Space and Security Studies.[98]

Here is another example, cited by Richard Garwin of IBM. In 1975 a fire at a Soviet gas pipeline was mistaken in the United States for a missile launch. With an ABM space-based defence system, such a situation could lead to disaster. In Richard Garwin's words, "It's like a whole bunch of sparking switches in a gasoline-filled room."[99]

Now let us imagine that there is an American "shield" in space and that the Soviet Union has deployed one in response. Both "shields" are huge computerised systems. Boris Raushenbakh, a noted Soviet expert in space technology, has suggested what might happen then. It is quite probable that the two systems would make contact with each other. It could happen that encoded signals would be received by both systems, regardless of which side they originated from. The two systems could "come to terms" and form an integral system in space that would be beyond human control. If we prove unable to come to a mutual understanding, computers might make a deal without our participation or even against us.[100]

The possibility of such dangers was underscored by the *Challenger* space shuttle disaster in January 1986. That accident proved that sophisticated technology launched into space can be fatally dangerous. In Dr. Bowman's opinion, all seven of the *Challenger's* crew gave their lives not only for space research, but for preventing the death of thousands of millions of people. The formidable danger that would come from weapons deployment in space must be realised still more by humanity.[101]

It is particularly important, of course, that this be realised by policy makers. Soviet leaders are well aware of the emerging danger. In a speech to scientists at the Kremlin on July 14, 1986, Mikhail Gorbachev said: "Let us presume that the arms race spreads to outer space. Who can say for certain what will happen then? There are just a few dozen satellites and spaceships in space right now, but emergencies of all kinds happen to them time and again. So what if echelons of military systems are moved there? They would be controlled by computers, which would issue data, but would not analyse the reasons for whatever was happening up there. As a result, the "decisions" upon which the fate and lives of millions of people depend would be made at the technical rather than political level. The whole of civilisation would become technology's hostage." (See Appendix 3)

Unfortunately, the US administration has not yet awakened to the urgency of the situation, though the *Challenger* disaster was followed by the explosion of the Titan 34D and Delta missiles. Once again technology has proved to be accident-prone. A successful launch of the Titan 34D missile, according to a Pentagon spokesman, was meant to inspire the SDI researchers.

SDI Victims

One of the victims of SDI is practically the whole system of international treaties limiting the nuclear arms race that has been built over the decades by the East and the West with so much difficulty. Kenneth Adelman, Director of the US Arms Control and Disarmament Agency, has openly stated that the SDI project may eventually require that the United States revise arms control agreements or reject them unilaterally.[102]

When might this happen? Dr. J. Tirman of the Union of Concerned Scientists believes that the field testing of the key SDI component, i.e., a space tracking system, is already in violation of the ABM Treaty.[103] In Dr. Carl Sagan's opinion, the entire Star Wars programme violates the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, the Treaty on the Non-Proliferation of Nuclear Weapons, the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems, and the SALT-1 and SALT-2 Treaties.[104]

President Reagan has repeatedly stated that the SALT-2 Treaty is "dead". His advisers have used every opportunity to lash out at the ABM Treaty as allegedly leaving the United States "helpless" in the face of a potential nuclear attack from the Soviet Union.

Though the ABM Treaty appears to be a pain in the neck for the administration and scientific "warriors", it enjoys widespread support in the US scientific community. The National Campaign to

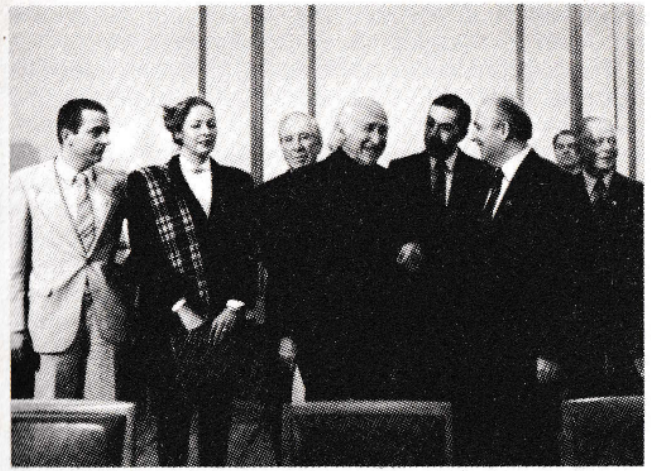
Save the ABM Treaty and the Federation of American Scientists, regarding the treaty as the basis of international security, are in the forefront of the struggle to save it.[105]

A similar situation is developing with regard to the 1963 and 1974 treaties on limiting nuclear tests. SDI experiments, especially those involved in developing an X-ray laser, are violating the restrictions imposed by these treaties. Two British physicists, Dr. Allen and Dr. Dombey, have pointed out that that particular testing requires yields much in excess of the 150 kiloton limit for underground explosions imposed by the 1974 treaty. Many American specialists support their opinion. The treaty also forbids testing in outer space, and the laser can only really be tested there.[106]

Advocates of arms control agreements are well aware that if these agreements are abandoned, it will become impossible to protect the ultimate victim of SDI—international peace and security. There have been persistent attempts to get the US Congress to realise this, since it is the body that has the power and the influence to bring about some practical change in Washington. In June 1986 over 1,600 scientists and engineers, among them Nobel Prize winners and heads of research establishments, representing 26 government and 52 industrial laboratories in the United States addressed an open letter to Congress urging it to slash appropriations for Star Wars.

Their efforts were rewarded. In August 1986 the House of Representatives substantially reduced the administration's budget proposals for Star Wars in the coming fiscal year. It extended the ban on appropriations for anti-satellite weapon tests involving actual targets in space.[107]

Scientists are not abandoning their attempts to



Mikhail Gorbachev talking to Professor Wald of Harvard University while meeting a delegation from a congress of Nobel prize winning scientists. The Soviet position: the USSR will not be the first to deploy weapons in space.

influence the administration. In 1985 the Union of Concerned Scientists addressed a message to the leaders of the Soviet Union and the United States signed by 700 members of the National Academy of Sciences, including 54 Nobel Prize winners. It urged the two governments to sign a treaty banning the testing or deployment of weapons in space.

Mikhail Gorbachev was prompt to give a thorough and positive reply. He reminded the scientists that the Soviet Union had assumed a unilateral undertaking not to deploy anti-satellite

weapons in space as long as the United States refrained from doing so. (See Appendix 3)

The White House, once again ignoring scientific opinion, deemed it unnecessary to reply to the message at all.

This only made the scientists campaign even more vigorously in Congress. As a result, Representatives George Brown, John Seiberling, Joe Moakley and Matthew McHugh jointly with members of the Union of Concerned Scientists launched a suit at a District of Columbia court to try to prevent anti-satellite weapon testing through juridical means.[108]

In late March 1984 a Coalition for the Peaceful Uses of Space was set up in the United States, comprising the Federation of American Scientists and Physicians for Social Responsibility. The founding members included Senator Paul Tsongas and 12 members of the House of Representatives.

The American scientists' anti-war campaign has begun to bear fruit. The Star Warriors are grudgingly admitting this. General Abrahamson has said that the SDI Organisation is facing strong and growing opposition.[109] Edward Teller himself has complained that he is perplexed as to why a great many American scientists are campaigning against a "defensive shield", and says that this is hampering his work.[110]

The anti-war activities of American scientists have become so large-scale and effective that they have begun to be seen as a serious obstacle to reactionary propaganda. The Star Wars recruiters have run out of advertising tricks, and their arguments have been increasingly exposed as false and pretentious. As has happened many times before, they have been forced to switch from persuasion to coercion. There are many ways of coping with

intransigence; they were used in the McCarthy period and can always be used again.

The signal for the counter-attack was a speech by Secretary of State George Shultz at the National Academy of Sciences. He complained that in recent years scientists had often embraced political ideas that could not be called responsible or particularly brilliant.[111] The signal was duly understood. Robert Jastrow accused the Union of Concerned Scientists of stirring up bad feelings among scientists by distributing petitions that, he said, resembled "Soviet propaganda". The White House charged that SDI had become a target of Soviet disinformation by proxy.[112] That was a signal for a witch hunt.

And a witch hunt did get under way at American universities. To orchestrate it, a special organisation was set up called Accuracy in Academia. Its founders set out to create a network of secret informers at colleges and universities in order to single out instructors adhering to left-wing views, castigate them in the press, insult them and interfere with their work. They were branded" dangerous liberals" for discussing some of the tenets of Marxism with students and, even worse, talking to them about the dangers involved in the nuclear arms race. Similar harassment was used against Ernest Dubois, a black university professor at Stony Brook (New York), Professor B. Allman of the University of Maryland, the historian D. Abraham, and other academics.[113] Dr. Arnold Lockshin, a noted cancer researcher, was forced to leave the United States and seek political asylum in the Soviet Union.

Referring to the shameful campaign, Thomas Mann, Executive Director of the American Political Science Association, said that it had every appear-

ance of an intellectual pogrom. Ernst Benjamin, General-Secretary of the American Association of University Professors, described the situation as horrible and repulsive.[114]

In spite of this, however, there is growing opposition among American scientists to the plans to militarise space. Protests are also mounting in the international scientific community.

In Britain, a large group of scientists have refused to contribute to SDI computer research. The decision was announced in a message to the American Vice-President, George Bush, which was signed by 80 prominent university researchers in Edinburgh and other cities. Specialists affiliated to the organisation Computer Professionals for Social Responsibility have also spoken out against scientific discoveries being used for militarising space.[115]

In the Federal Republic of Germany, distinguished scientists have founded an organisation calling itself Responsibility for Peace. They are urging the rejection of the US President's "initiative". Two hundred scientists have sent a message to the FRG's Chancellor, Helmut Kohl, in which they stated their refusal to join the project because they considered themselves supporters of the 18 atomic scientists (Max Born, Otto Hahn, Werner Heisenberg, Max von Laue and others) who in 1957 signed the Göttinger Manifesto against the development of nuclear weapons. The message said that 30,000 West German experts in various fields had refused to participate in the SDI project.[116]

In Canada, 800 scientists and experts have signed a petition addressed to the Prime Minister, Brian Mulroney, urging him not to join in SDI.[117] Their views certainly had something to do with the

Canadian government's decision to turn down its neighbour's invitation.

In Italy, the Scientific Council of the Committee of Italian Scientists has spoken out against SDI. An opinion poll among Italian specialists has indicated that only eight per cent regard an SDI "space shield" as technologically feasible, while 85 per cent feel very pessimistic about it.[118]

In France, the Sorbonne has held a conference entitled Scientists Against Nuclear Suicide. Biologist Albert Jacquard said the aim of the forum was to tell people the truth about the fatal danger involved in the nuclear arms race and to remove the mountains of lies and disinformation that surround the issue. Professor Robert Pages considers that all those who are preparing to destroy the human race in a nuclear war using the Hiroshima and Nagasaki scenario must be publicly declared as enemies of humanity.[119]

In Japan, almost 80 per cent of the members of the Physics Society have condemned SDI. Over 70 per cent intend to refuse to participate in Star Wars research. In all, some 10,000 Japanese researchers have signed a petition protesting against the country's involvement in the SDI programme.[120]

Soviet scientists are playing an ever greater role in the efforts to stop the US space adventure. In April 1983 they made an appeal to scientists all over the world, criticising the SDI concept, then just made public. This drew favourable political response internationally. In 1986 they issued an appeal to American scientists, supporting the proposals for nuclear disarmament outlined in Mikhail Gorbachev's statement of January 15, 1986. In 1983 and 1986 there were two large conferences of Soviet and foreign scientists in Moscow in defence of peace and against the threat of nuclear

war. They put forward arguments against the SDI concept and analysed in detail the ways to counter space weapons.

Soviet scientists have published two books in English that have aroused a great deal of interest in the West. Prepared by the Committee of Soviet Scientists in Defence of Peace, Against the Nuclear Threat, they are *The Night After*, which examines the climatic and biological consequences of nuclear warfare, and *Weaponry in Space: the Dilemma of Security* (both put out by Mir Publishers, Moscow).

An important role in the international scientists' campaign against nuclear and space weapons is being played by the World Federation of Scientific Workers. Its founders and first leaders were John Bernal and Frédéric Joliot-Curie. In October 1985, the WFSW organised a symposium in Prague to discuss the role of scientists in preventing the militarisation of outer space. The symposium's participants agreed that SDI not only could not guarantee a full and effective anti-missile defence, but would increase the possibility of nuclear war, threaten the existence of international agreements and lead to the further militarisation of science. A WFSW-sponsored international forum of scientists in Moscow in July 1986 adopted a similar appeal. The forum, which was held under the motto "Science, Technology and Peace", was attended by 250 scientists from 59 countries.[121]

In November 1986, natural scientists held an international congress in Hamburg, in the Federal Republic of Germany, devoted to the same problem. There were 350 noted scientists from 23 countries and more than 3,000 West German researchers. The congress approved an important

document called the Hamburg Proposals for Disarmament.

This document calls for banning space-strike weapons.

The deployment of a large-scale anti-ballistic missile defence with space-based elements would generate fears that some components of this system might be used for a first strike. Naturally, this would force the other side to deploy more strategic offensive arms in order to be able to overcome this defence. Mutual realisation of this danger in the United States and the Soviet Union led to the signing in 1972, following talks between the two countries, of the Treaty on the Limitation of Anti-Ballistic Missile Systems (the ABM Treaty).

The validity of the arguments in favour of that Treaty continues. Yet, there is a real threat that the provisions of the Treaty prohibiting the deployment of a national anti-ballistic missile defence or the development and testing of ABM systems and their sea-, air-, space- or mobile land-based components might be violated. If the ABM Treaty were to be abandoned in favour of strategic defence, the arms race would enter onto a new plane, rendering other arms control provisions and agreements ineffective. It is necessary to find ways not only of safeguarding the ABM Treaty but of strengthening it.

An anti-missile defence with space-based elements would be a destabilising factor because it would have the capability of destroying satellites, including space-based components of the other side's ABM system.

"The rejection of elaboration, testing and deployment of anti-satellite systems," the Proposals

say, "is an important step on the road to the banning of all types of space-based weapons."

Outstanding natural scientists were unanimous in their condemnation of SDI at their round-table conference held in Moscow as part of the International Forum "For a Nuclear-Free World, for the Survival of Humanity" in February 1987 and attended by over 300 scientists from 33 countries. Academician Evgeni Velikhov said that invitations to the Forum had also been sent out to SDI supporters, including researchers at the Lawrence Livermore National Laboratory, Edward Teller among them. But, obviously because they felt the weakness of their position and were afraid to find themselves in the absolute minority among the world's foremost scientists, none of them came to Moscow.

In his widely publicised speech to the Forum participants, Mikhail Gorbachev largely drew on the conclusions of the scientists gathered at the Forum. (See Appendix 3)

The illusions behind the Star Wars project have been exposed by the influential Pugwash movement of scientists. In December 1985 Pugwash scientists held a symposium in London. They stated that the programme's implementation would dramatically increase the race in offensive and defensive arms, destroy all existing arms control agreements, increase the risk of nuclear war, and result in a criminal squandering of the scientific, technological and economic resources in most of the economically developed world.[122]

The views of many millions of people have been greatly influenced by the activities of an organisation called International Physicians for the Prevention of Nuclear War. The organisation was awarded the 1985 Nobel Peace Prize, which was

presented to its co-chairmen—Academician Evgeni Chazov of the Soviet Union and Professor Bernard Lown of the United States. In 1986 a Congress of International Physicians in Cologne took a strong stand against weapons in space. Medicine would be powerless to help people in the event of nuclear war. The congress made out a symbolic Peace Prescription obliging people to work untiringly for a peaceful space and earth. It proposed a Medical Space Programme instead of SDI, that is, a system of international medical consultation through the use of space technology.

Cito!

This Latin word is used by doctors to indicate that a patient is in urgent need of help.

Such help is needed now to stop the dangerous course of events in this nuclear age. Humanity needs a vaccine against Star Wars madness and the arms plague. And this help must come soon, or it will be too late.

Medical scientists say that this vaccine should be the reduction and then the scrapping of all nuclear weapons. The top priority now, however, is to stop weapons from being deployed in space. Hugh DeWitt, a theoretical physicist, has arrived at the same conclusion after working at the Livermore laboratory for 27 years. He believes that weapons in space would be vastly dangerous because they would dramatically escalate the risk of nuclear war, but, contrary to the President's promises, would be incapable of protecting the civilian population. The Strategic Defence Initiative must be stopped.[123]

Richard Garwin is convinced that the key to security lies not in new technology but in progress at the negotiating table.[124]

This exemplifies a new thinking in our nuclear age that is slowly but surely winning new supporters, including political leaders. It is the sacred duty and responsibility of every scientist as "Man Thinking" to promote this new outlook in order to overcome the barriers of ignorance and misinformation.

Scientists who have come to this new thinking propose that the entire intellectual wealth and the whole potential of modern science be placed at the service of peace and people's vital needs.

When Professor Joseph Rotblat of London University met Mikhail Gorbachev at the Kremlin in July 1986, he told him about a scientists' forum for an end to nuclear testing that was then taking place: "Although we are scientists, we are discussing an issue which is mostly political. But scientists have played a very important and sometimes negative role in this issue... Later (after the Second World War.—*Ed.*) ... many scientists voluntarily and even enthusiastically participated in the nuclear arms race... We hope that the efforts we have undertaken here will help restore the tarnished image of science as a creative force working for the good and welfare of mankind."

Mikhail Gorbachev said in reply: "Today it is more important than ever before that politics and science cooperate. Today it is essential that every field of science analyse the political consequences of its discoveries and achievements. And likewise, politics must be based on scientific achievements, on the strict analysis, objective evaluations and predictions offered by science. I favour the unification of politics and science." (See Appendix 3)

Addressing the participants in the Moscow Forum, Mikhail Gorbachev said that the people of the world could and must prevent nuclear catastrophe. He said: "The movement of scientists for the elimination of the nuclear threat, the fervent and most competent speeches by physicians, environmentalists, cultural figures and workers in the arts, and the appearance of various anti-nuclear groups and associations are all clear evidence of the determination of soberminded people everywhere to save the precious gift of life on earth, perhaps the only one of its kind in the Universe."

US Secretary of State George Shultz, however, disagrees. He is of the opinion that scientists should not pull any special weight in world politics, in the social sphere or in deciding the military doctrine.[125] This implies that a scientist's job is just to invent things, and that how his inventions are used should not be his concern. The most surprising thing is that this point of view is supported by quite a few representatives of the academic community in the West.

Ronald Geldenbach, a university nuclear researcher in Michigan, has quipped that he is doing basic research to discover the fundamental laws of nature. The laws of nature, according to him, do not change because the research is financed by SDI.[126]

Certainly, the laws of nature do not change. But the question is whether these laws will be used for people's benefit or their harm. Responsible scientists have realised that Star Wars would be used against people's interests. In April 1983 a group of leading Soviet scientists, including Nobel Prize winners, addressed their colleagues throughout the world saying, among other things, this: "Today, when our future and the future of coming gener-

ations is being decided, every scientist, guided by his knowledge and his conscience, must take an honest and definite stand on what direction the world should advance—towards the development of new types of strategic weapons, increasing the danger of a mutually-annihilating conflict, or towards limiting the arms race and subsequently achieving disarmament. This is the historic moral duty of scientists to humanity." (See Appendix 2)

There are a number of interim goals to be reached before the arms race can be stopped. A solution is necessary to those problems of military confrontation that constitute the greatest danger to peace. For this reason, scientists suggest that the nuclear menace be reduced by taking priority action in such key fields as preventing the militarisation of space and turning space into a sphere of peaceful international cooperation.

Daniel Deudney, an American researcher, has this to say about that: "Just because war led people into space does not mean that removing warlike activities will sap the urge to explore or use it. Now if people can take one more step and 'race' toward a goal with practical value, the excitement of the early space age can be captured."[127]

Richard Garwin thinks that SDI research should be turned into normal laboratory research without nuclear testing and that, on this basis, agreements should be sought with the Soviet Union.[128]

Public Interest Report, a magazine published by the Federation of American Scientists, suggests that direct links be established between Soviet and American space flight centres, and that crew exchanges should take place involving Soviet space stations and American re-usable spacecraft.[129]

Carl Sagan has made an even more daring proposal: a joint Soviet-US expedition to Mars, a

project which he estimates would cost half the price of Star Wars.[130] The proposal was later concretised. Several American scientists proposed launching the Martian project in 1992 to mark 500 years since Columbus discovered America and the 75th anniversary of the Great October Socialist Revolution. Louis Friedman, Executive Director of the Planetary Society, believes that such an undertaking would do a lot of good for international security and stability. In February 1985, the US Congress approved Senator Matsunaga's resolution on starting preparations for Soviet-American flights to Mars.[131]

The leading Soviet political and theoretical journal *Kommunist*, while describing the proposal as "constructive in itself", added that its realisation depended on the position of US political leaders on the cardinal problems of our times, including the problem of the non-militarisation of outer space.[132]

Humanity is on the threshold of gigantic strides in space exploration, which requires international cooperation on a large scale. There are many things to be achieved, such as the more intensive use of terrestrial space for scientific and economic needs, or studies of other planets of the solar system. But these opportunities can only be used if no weapons, offensive or defensive, are deployed in space.

Scientists in the East and the West have repeatedly stated—and proved—that peaceful research would in no way be adversely affected if military research and arms production were ended. Weapons researchers could work effectively in peaceful areas. Neither weapons-oriented science nor industry would be left idle. The key to this lies in starting large-scale and open international

cooperation in fundamental research, including the launches of interplanetary ships, the use of space research for the betterment of life on earth, joint development of new space technology and its utilisation for the common good, and in the more distant future, the industrialisation of terrestrial space.

To these ends, the Soviet Union has proposed establishing a World Space Organisation to coordinate efforts in this all-important enterprise.

In June 1986, the Soviet Prime Minister, Nikolai Ryzhkov, sent a message containing the Soviet Union's official proposals to the UN Secretary-General that outlined a programme of joint practical actions for the peaceful exploration of space. This is a three-stage programme aimed at laying down a firm material, political, legal and organisational basis for Star Peace by the year 2000.[133]

The USSR is also prepared to cooperate in the peaceful exploration of space on a bilateral basis with all countries, including the United States.

Our cooperation with the United States has many traditions. We in the Soviet Union well remember that the first contacts between Russia and America are associated with two great personalities—Mikhail Lomonosov and Benjamin Franklin. Their names are a symbol of our best traditions of the past, and a guiding star for the future. There have been more recent and equally bright episodes of our cooperation. One of them was the joint *Soyuz-Apollo* space mission.

* * *

I want to end this book on an optimistic note. I am sure that everyone would like to see Reason emerge the winner out of the present political struggle. This is the only option. For thousands of years people have followed the stars. Astrologists have tried to foretell the future by the stars. Lovers have kissed, and poets have written their verses under the stars. Now the Star Wars plague threatens to destroy everything—the past, the present and the future. But people remain hopeful. They hope that their thoughts, work and family lineage will continue. We must all work hard for these hopes to become a reality. We must work hard for Star Peace. "Man Thinking" is in the forefront of this difficult struggle. He has the power to send the Excalibur Star Wars Sword into oblivion forever.

Appendices

Russell-Einstein Manifesto

April 1955

In the tragic situation which confronts humanity, we feel that scientists should assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction, and to discuss a resolution in the spirit of the appended draft.

We are speaking on this occasion, not as members of this or that nation, continent or creed, but as human beings, members of the species man, whose continued existence is in doubt. The world is full of conflicts; and, overshadowing all minor conflicts, the titanic struggle between Communism and anti-Communism.

Almost everybody who is politically conscious has strong feelings about one or more of these issues; but we want you, if you can, to set aside such feelings and consider yourselves only as members of a biological species which has had a remarkable history, and whose disappearance none of us can desire.

We shall try to say no single word which should appeal to one group rather than to another. All, equally, are in peril, and, if the peril is understood, there is hope that they may collectively avert it.

We have to learn to think in a new way. We have

to learn to ask ourselves, not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is: What steps can be taken to prevent a military contest of which the issue must be disastrous to all parties?...

We invite this congress to be convened, and through it the scientists of the world and the general public, to subscribe to the following resolution:

Appeal to the Governments of the World

"In view of the fact that in any future world war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the governments of the world to realize, and to acknowledge publicly, that their purposes cannot be futhered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them."

Einstein on Peace, compiled by Otto Natan and Heinz Norden and prefaced by Bertrand Russel. Simon & Schuster, New York, 1960.

Appeal to the Scientists of the World

We address this appeal to all people of good will, and above all to scientists, inasmuch as the task of preserving life and peace on earth has never been so urgent as it is today. All who are clearly aware of present-day realities realise what the unceasing buildup of deadly weapons and the development of ever new and more monstrous means of mass destruction portends. The security of the peoples can be ensured only by taking the road of nuclear disarmament through a series of purposeful agreements based on the self-evident principle of equality and equal security.

However, in his speech on March 23 of this year the US President offered the American people a different prospect—the creation of a new giant complex of land- and space-based anti-missile weapons, allegedly for defensive purposes, which, he said, would fully guarantee the United States' security in the event of a global nuclear conflict.

Proceeding from the knowledge we have as scientists and our understanding of the nature of nuclear weapons, we declare with full responsibility that there are no effective means of defence in a nuclear war and that it is practically impossible to develop such means.

This opinion of ours fully conforms to the authoritative and responsible statement of the presidents and representatives of 36 academies of sciences of different countries, signed, among others, by representatives of the National Academy of Sciences of the United States, the Royal Society of Great Britain, the Academy of Sciences of France, and the Academy of Sciences of the USSR.

In fact, the attempt to develop so-called "defensive weapons" against the strategic nuclear forces of the other side, of which the US President speaks, will inevitably create one more element increasing the US "first-strike" potential. It is not accidental that the practical actions of the US Administration are now concentrated on the rapid development of precisely this potential. Such "defensive weapons" could give almost nothing to a country subjected to a sudden massive attack, inasmuch as they are clearly incapable of protecting the vast majority of the population. The use of anti-missile weapons most of all suits the purposes of the attacking side out to lessen the power of a retaliatory blow. However, they are also incapable of fully warding off this retaliatory blow.

Thus, the initiative of the US President, who promises to develop new anti-missile weapons, is obviously aimed at destabilising the existing strategic balance. By his statement, the President creates a very dangerous illusion, which could lead to an even more menacing round of the arms race. We are firmly convinced that this move will sharply impair international security, including the security of the United States itself. The US Administration demonstrates its utter irresponsibility in the matter of the very existence of mankind.

Today, when our future and the future of coming generations is being decided, every scientist,

guided by his knowledge and his conscience, must take an honest and definite stand on what direction the world should advance—towards the development of new types of strategic weapons, increasing the danger of a mutually-annihilating conflict, or towards limiting the arms race and subsequently achieving disarmament. This is the historic moral duty of scientists to humanity.

Proceeding from a strictly scientific analysis of all aspects of this problem, we are firmly convinced that nuclear disarmanent is the only way for the states and peoples to achieve genuine security.

Signed by

V. S. Avduyevsky, A. G. Aganbegyan, N. V. Ageyev, M. I. Agoshkov, A. D. Alexandrov, A. P. Alexandrov, I. P. Alimarin, Zh. I. Alfyorov, O. K. Antonov, V. A. Ambartsumyan, G. A. Arbatov, B. A. Arbuzov, V. G. Afanasyev, K. S. Bagdasaryan, A. A. Bayev, A. M. Baldin, V. P. Barmin, N. G. Basov, A. F. Belov, O. M. Belotserkovsky, D. K. Belayev, S. T. Belayev, R. A. Belyakov, N. P. Bekhtereva, N. N. Blokhin, N. N. Bogolyubov, O. T. Bogomolov, G. K. Boreskov, N. A. Borisevich, A. S. Borovik-Romanov, A. A. Bochvar, A. Y. Braunstein, L. M. Brekhovskikh, Y. V. Bromley, N. G. Bruyevich, B. V. Bunkin, G. S. Byushgens, B. K. Weinstein, N. A. Vatolin, Y. P. Velikhov, V. S. Vladimirov, S. V. Vonsovsky, A. A. Voronov, B. M. Vul, O. G. Gazenko, A. V. Gaponov-Grekhov, D. M. Gvishiani, M. S. Gilyarov, V. L. Ginzburg, I. A. Glebov, V. P. Glushko, V. I. Goldansky, P. D. Grushin, N. D. Devyatkov, G. G. Devyatykh, B. A. Dolgoplosk, N. A. Dollezhal, A. A. Dorodnitsyn, N. M. Druzhinin, M. M. Dubinin, N. P. Dubinin, A. G. Yegorov, N. S. Yenikolopov, A. N. Yefimov, N. M. Zhavoronkov, B. P. Zhukov, S. N. Zhurkov, T. I. Zaslavskaya, G. T. Zatsepin, Y. B. Zeldovich, V. Y. Zuyev, A. V. Ivanov, L. F. Ilyichov, A. A. Im-

shenetsky, N. N. Isanin, A. Y. Ishlinsky, M. I. Kabachnik, B. B. Kadomtsev, L. V. Kantorovich, P. L. Kapitsa, B. M. Kedrov, L. V. Keldysh, I. K. Kikoin, M. P. Kim, V. A. Kirillin, S. T. Kishkin, I. L. Knunyants, Y. B. Kobzarev, S. N. Kovalyov, A. N. Kolmogorov, M. N. Kolosov, Y. M. Kolotyrkin, A. N. Kononov, F. V. Konstantinov, V. A. Koptyug, D. S. Korzhinsky, V. V. Korshak, P. G. Kostyuk, Y. A. Kosygin, V. A. Kotelnikov, N. K. Kochetkov, P. Y. Kochina, N. N. Krasovsky, A. A. Krasnovsky, Y. M. Kreps, V. A. Kuznetsov, V. I. Kuznetsov, N. D. Kuznetsov, A. M. Kunayev, G. V. Kurdyumov, S. S. Kutateladze, Y. M. Lavrenko, M. M. Lavrentyev, B. N. Laskorin, V. A. Legasov, L. M. Leonov, M. N. Livanov, V. P. Linnik, Y. M. Lifshits, D. S. Likhachov, A. A. Logunov, A. M. Lyulka, V. A. Magnitsky, V. P. Makeyev, M. A. Markov, G. I. Marchuk, L. A. Melentyev, V. A. Melnikov, P. I. Melnikov, V. V. Menner, A. B. Migdal, A. A. Mikulin, A. G. Mileikovsky, K. M. Minachev, I. I. Mints, M. B. Mitin, A. A. Mikhailov, V. P. Mishin, Y. N. Mishustin, Y. N. Molin, A. D. Nadiradze, A. L. Narochnitsky, Y. A. Negin, N. N. Nekrasov, Y. Y. Nesterikhin, M. V. Nechkina, G. A. Nikolayev, B. P. Nikolsky, S. M. Nikolsky, S. P. Novikov, V. V. Novozhilov, A. V. Novosyolova, I. F. Obraztsov, A. M. Obukhov, Y. A. Ovchinnikov, T. I. Oizerman, Y. A. Osipyan, B. Y. Paton, A. V. Pejve, G. I. Petrov, B. V. Petrovsky, I. V. Petryanov-Sokolov, B. B. Piotrovsky, A. V. Pogorelov, B. N. Ponomaryov, B. M. Pontekorvo, L. S. Pontryagin, V. I. Popkov, Y. M. Primakov, A. M. Prokhorov, Y. V. Prokhorov, V. S. Pugachov, Y. N. Rabotnov, G. A. Razuvayev, V. N. Remeslo, O. A. Reutov, V. V. Rzhevsky, A. M. Rumyantsev, B. A. Rybakov, N. N. Rykalin, R. Z. Sagdeyev, V. D. Sadovsky, M. A. Sadovsky, A. S. Sadykov, A. A. Samarsky, A. M. Samsonov, G. P. Svishchev, S. Y. Severin,

A. B. Severny, L. I. Sedov, V. S. Semenikhin, N. N. Semyonov, Y. M. Sergeyev, D. V. Skobeltsyn, A. N. Skrinsky, G. K. Skryabin, V. I. Smirnov, V. V. Sobolev, S. L. Sobolev, B. S. Sokolov, V. Y. Sokolov, V. I. Spitsyn, G. V. Stepanov, V. V. Struminsky, M. A. Styrikovich, I. V. Tananayev, L. P. Tatarinov, L. V. Tauson, A. L. Takhtadzhyan, S. L. Tikhvinsky, A. N. Tikhonov, V. A. Trapeznikov, A. F. Treshnikov, A. A. Trofimuk, V. M. Tuchkevich, L. D. Faddeyev, N. P. Fedorenko, P. N. Fedoseyev, G. N. Flerov, A. V. Fokin, I. M. Frank, Y. B. Khariton, T. S. Khachaturov, M. B. Khrapchenko, S. A. Khristianovich, A. I. Tselikov, Y. I. Chazov, M. K. Chailakhyan, V. N. Chelomei, P. A. Cherenkov, G. G. Chorny, N. V. Chersky, F. V. Chukhrov, A. I. Shalnikov, A. Y. Sheindlin, N. A. Shilo, V. S. Shpak, M. M. Shultz, A. N. Shchukin, N. M. Emanuel, V. A. Engelgardt, A. S. Yakovlev, N. N. Yanenko, A. L. Yanshin.

April 1983

Mikhail Gorbachev about SDI

A Reply to the Union of Concerned Scientists

"Pravda", July 6, 1985

Dear Mr Kendall,

I have received the message sent by you on behalf of the Union of Concerned Scientists calling for a ban on space weapons. I want to say that I deeply respect the opinion of prominent scientists who are more keenly aware than many others of what dangerous consequences for mankind the spreading of the arms race to outer space and the conversion of space into an arena of military rivalry could have.

The Union of Concerned Scientists has every ground to demand that a clear and irrevocable political decision be made which would prevent militarisation of outer space and leave it free for peaceful cooperation. This issue indeed requires a bold approach. The standards of yesterday, and narrow, moreover illusory, notions, of one-sided benefits and advantages are not applicable here. What is needed now, as never before, is a farsighted policy based on understanding of the realities and the dangers which we shall inevitably encounter tomorrow, if today those who can and must make the only correct decision evade the responsibility that rests with them.

On behalf of the Soviet leadership I want to make it quite clear that the Soviet Union will not be the first to step into space with weapons. We shall make every effort to convince other countries, and above all the United States of America, not to take such a fatal step which would inevitably increase the threat of nuclear war and spark off an uncontrolled arms race in all areas.

Proceeding from this goal, the Soviet Union, as you evidently know, has submitted a radical proposal to the United Nations—a draft treaty on the prohibition of the use of force in space with regard to earth. If the United States joined the vast majority of states that have supported this initiative, the issue of space weapons could be closed once and for all.

At the Soviet-American talks on nuclear and space arms in Geneva we are trying to reach agreement on a full ban on the development, testing and deployment of space-based strike systems. Such a ban would make it possible to preserve space for peaceful development, research and scientific discoveries, and, moreover, to start the process of sharply reducing and ultimately scrapping nuclear weapons.

We have also repeatedly taken unilateral steps intended to set a good example to the United States. For two years now the moratorium introduced by the Soviet Union on the placement of anti-satellite weapons in outer space has been operative and it will continue to remain in force as long as other states do likewise. Lying on the table in Washington is our proposal that both sides terminate completely all work on the development of new anti-satellite systems and that such systems

as the USSR and the United States already possess (including those still undergoing tests) be eliminated. The actions of the American side in the near future will show which decision the US Administration will prefer.

Strategic stability and trust would clearly be strengthened if the United States agreed, together with the USSR, to reaffirm in binding form its commitment to the provisions of the Treaty on the Limitation of Anti-Ballistic Missile Systems, a treaty of unlimited duration. The Soviet Union is not developing space weapons or a large-scale ABM system. Nor is it laying the foundation for such a system. It strictly abides by its obligations under the treaty as a whole and in its particular aspects, and unswervingly observes the spirit and the letter of that highly important document. We invite the American leaders to join us in this and to renounce plans for space militarisation now in the making, plans that would inevitably lead to the negation of that document, which is the key link in the entire process of nuclear arms limitation.

The USSR proceeds from the premise that the practical fulfilment of the task of preventing an arms race in space and terminating it on earth is possible given the political will and a sincere desire by both sides to work towards this historic goal. The Soviet Union has that desire and that will.

I wish the Union of Concerned Scientists and all its members success in the noble work it is doing for the good of peace and progress.

Yours respectfully,
Mikhail GORBACHEV

Speech at a Meeting in the Kremlin on November 13, 1985, with a Delegation from the Nobel Prize Winners' Congress

"Pravda", November 14, 1985

It is with pleasure that I receive a message signed by outstanding scientists, Nobel Prize Winners. I would like to say right away that the Soviet leadership views this message as a document of tremendous significance for all humankind. Its appeal to the two great powers to ensure a turn for the better in international affairs, put an end to the arms race and prevent the militarisation of outer space is in full accordance with the sentiments in our country and the practical intentions of its leaders.

Our time is, without exaggeration, a critical period in history. Mankind has now reached a point which calls for particular wisdom in decision-making, thoughtfulness, restraint in action and consideration not just for one's own national interests but for the interests of the entire world community. I believe that understanding of this underlies the initiative of the Nobel Prize Winners.

We in the USSR feel there is no task more important and pressing today than to block the channels for further stockpiling of nuclear weapons, and of their increasingly sophisticated models what's more, and at the same time close outer space to weapons. This is consistent with our views and the proposals we will take to the Soviet-American summit in a few days.

Our approach to that meeting is open and fair. We go to Geneva completely aware of the respon-

sibility that rests on the leaders of all countries, first and foremost those of the USSR and the United States. We go there for serious and productive work and, I must say, not empty-handed.

The Soviet Union would like for the meeting to help practically in resolving the key issues of our times—consolidating world peace and security, improving relations between the USSR and the United States, curbing the arms race and preventing its extension to outer space.

We are firmly convinced that it is especially important today that every thinking person be fully aware of his personal responsibility in preventing the war threat. It is only natural that scientists, who perhaps have a clearer conception than others of the likely consequences of a nuclear war, raise their voice against all wars, be they terrestrial or "star" wars. This is how I interpret your message. Our country highly values the humanist tradition of genuine scientists who have always taken an active stand on the issue of war and peace, a tradition begun by Niels Bohr, Albert Einstein and Frédéric Joliot-Curie.

Ours is truly the "Golden Age" of science. The bounds of knowledge are expanding at an exceptionally rapid rate. From the microcosm to outer space, human reason is penetrating depths and secrets of nature which seemed beyond our reach only a short time ago. Making full use of the fruits of knowledge would make it possible to enrich qualitatively man's material and intellectual life.

Is it not a horrible paradox of the 20th century that scientific achievements are being used to develop weapons of mass annihilation, thus threatening the very existence of the human race?

The issues of war and peace have been called to the forefront by the objective course of development. Scientists and their influence and competent opinion can and are called upon to play a large role in awakening people's awareness and urging them to take vigorous action to stop and reverse the arms race, to begin the reduction of armaments.

You are right in stressing in your message that courage is needed today not in preparing for war but in achieving peace. This is all the more true since the arms race has reached a critical stage. Even now advances in military technology have made arms control extremely difficult. We have reached a brink beyond which the situation may become entirely uncontrollable.

Whether strike weapons will make their way to outer space or be barred from it is an extremely acute question. The answer will determine the course of development in the world for many years to come. Can there be any peaceful future and strategic stability if yet another lethal danger, now from outer space, emerges in addition to the missiles already in silos and at ocean depths?

Imagine what the world would be like in ten or twenty years. Everywhere—from the edge of the atmosphere at a height of 100 km to the altitude of geostationary orbits—waves of strike weapons would be rushing over the heads of people on our planet.

The Soviet people, who have lived for 40 years surrounded by American "forward-based" weaponry, strongly oppose the very possibility of its extension to outer space and the very prospect of having it overhead, above their homes.

And how would ordinary Americans, who have not yet gotten accustomed to having others' weapons on their borders, either on earth or in space, take to such a prospect? I think that tension in relations between our countries would escalate

to a point unprecedented even by today's standards and be even more difficult to control.

The militarisation of space will be a heavy psychological burden on people in all countries and bring about an atmosphere of universal instability and uncertainty. The question arises: What's the purpose of all this? By the way, it is appropriate to ask the following question as well: Doesn't the very deployment of weapons by one state in outer space, above the territory of other states, constitute a violation of their sovereignty?

Soviet people often ask in their letters what the Soviet Union will do if the United States, in spite of everything, embarks on the development, testing and deployment of a multilayered anti-missile defence system. We have already said that the USSR will find an effective answer which, in our opinion, will maintain strategic equilibrium and its stability. But if this happens, there will be a new round of the arms race.

As we know, there have been no weapons in outer space as of yet. If they do appear there it will be exceptionally difficult to later remove them. And it is entirely unjustifiable to expect that the development of space strike arms will lead to the disappearance of nuclear weapons on earth. The history of the development of new types of weapons and the existing realities testify convincingly to the opposite.

Is there any logic in the idea that one must arm oneself to the teeth in order to disarm? In other words, why develop missiles to destroy missiles when there is a different, more dependable and safer way, and most important, one which leads directly to the goal—the way of reaching accords on the reduction and subsequent complete elimination of existing missiles?

It is clear that from all points of view and from the position of common sense the second way is the only reasonable one. We are for it.

As you know, our country proposes that the USSR and USA reduce by half nuclear weapons capable of reaching each other's territory. We have stopped all nuclear weapons tests. We have also unilaterally reduced the number of medium-range missiles in Europe. We are prepared to sign a non-aggression treaty and agree to the establishment of zones free from nuclear and chemical weapons.

All of our steps, like many proposals that are now on the negotiating table, taken together and individually, provide an opportunity to improve substantially the international situation, to reduce the threat of nuclear conflict and pave the way toward complete nuclear disarmament. We realise perfectly well that to live eternally under the threat of nuclear arms is a dismal prospect for humankind.

What alternative to this does the Strategic Defence Initiative provide? It is our deep conviction that it would mean only an unlimited and mutually escalating race in so-called "defensive" and "offensive" arms.

I have more than once given political assessment of SDI. I will not underline yet again its clearly imperial trend toward securing superiority—military and technological—over other states.

I will consider another aspect. It is said that SDI will ensure a breakthrough in technology. But even if we assume that its realisation will spur scientific and technological progress the question remains: at what price? The answer is absolutely clear—at the price of the development of suicidal weapons systems. More and more people, including those in the US, are coming to understand this.

We are for an essentially different way of ac-

celerating scientific and technological progress. We are for competition in technology and constructive cooperation in conditions of stable and just peace.

Is not outer space itself a very promising arena for international cooperation? We have now just begun exploring it in the interests of science and practical human activity. But how much has been achieved in such a short period of time! The first satellite, the first man in space, the first man on the Moon, landings on Venus and Mars, an excellent map of Venus.

These are just initial steps. Exploration of the boundless expanses of outer space must be made a joint undertaking of states.

We have submitted to the United Nations for consideration an extensive programme of peaceful cooperation in space. The USSR proposes a world space organisation, which would be the centre for coordinating efforts of all mankind in this undertaking.

This means fundamental science research including the launching of inter-planetary ships to Mars, for instance.

This means the application of achievements in space research in biology, medicine, materials science, weather forecasting, climate and nature studies, for the creation of global satellite communication systems and remote studies of the earth and the world's oceans.

And finally, this means the creation by joint efforts and the use, for the benefit of all peoples, of new space equipment, including large orbital scientific stations, various manned spaceships, and in the future, the industrialisation of near-earth space. Naturally, we are also prepared for peaceful cooperation in space on a bilateral basis with those

states that express interest in it. This fully applies to the United States as well.

You remember the *Soyuz-Apollo* link-up in 1975, an event which fascinated the entire world. Something is being carried out now as well: we are conducting studies of Venus and Halley's Comet jointly with American scientists within the framework of the international project Veha, and we participate, together with other countries, in a space search-and-rescue service.

This, however, is but a small fraction of what could be accomplished jointly. It is unwise to let such opportunities slip away.

Among the American public and American scientists, and in the US Congress, judging from everything, a great deal of interest is being expressed in the resumption of cooperation, and specific projects are being advanced. We are prepared to consider serious proposals of this kind.

Both military programmes and peaceful projects in space, including research, are costly undertakings. The greater the reason to choose the alternative of peaceful cooperation.

The mastering of thermonuclear synthesis is a promising area of international cooperation. This will provide mankind with a virtually inexhaustible source of energy, a man-made sun, as it were.

The idea of a controlled thermonuclear reaction was first advanced by Academician Igor Kurchatov in his well-known lecture in Britain back in 1956, when he familiarised the international scientific community with the work of Soviet scientists.

The Tokamak international pilot thermonuclear reactor project has been underway in Vienna since 1978 on the initiative of the Soviet Union with the participation of scientists of a number of West European countries, the United States and Japan.

It can be said even now that such a reactor is technically feasible, and, as specialists ascertain, can be built in the relatively near future, in any case before the year 2000.

During our recent visit to Paris we expressed corresponding considerations to President François Mitterrand of France. He responded positively to our proposal. We feel it is important, even vital, to pool the efforts of all states concerned in order to achieve thermonuclear synthesis and thereby solve one of the most acute global problems, the problem of energy.

There are many pressing tasks in the world today that require coordination and cooperation. I would like to emphasise once again that the Soviet Union is decidedly and consistently in favour of the broadest cooperation, of pooling the efforts of states to use the achievements of scientific and technological progress exclusively for peaceful purposes and human progress. I can assure you that the Soviet Union is fully prepared for such cooperation and has the goodwill for it.

I wish you success in your fruitful scientific activity, in the noble pursuits of maintaining a world without arms, a world without war.

From the Speech at the Meeting with Representatives of the International Forum of Scientists for Nuclear Test Ban

...We have reached a stage in the scientific and technological revolution when new discoveries can spur on the arms race and create a situation in which it will be far more difficult to even start talks.

Let us presume that the arms race spreads to outer space. Who can say for certain what will happen then? There are just a few dozen satellites and spaceships in space right now, but emergencies of all kinds happen to them time and again. So what if echelons of military systems are moved there? They would be controlled by computers, which would issue data, but would not analyse the reasons for whatever was happening up there. As a result, the "decisions" upon which the fate and lives of millions of people depend would be made at the technical rather than political level. The whole of civilisation would become technology's hostage.

Or take conventional arms. In this sphere, too, scientific discoveries serve as the basis for the appearance of weapons which, in terms of destructive capacity, are not at all inferior to nuclear weapons. In addition, there are chemical and biological weapons. The consequences of their use would be no less disastrous.

Thus we have all reached the point beyond which unpredictable processes can begin. Everyone must act today—politicians, scientists, and people everywhere...

Totally paradoxical arguments are used to defend the SDI. This, alas, draws a certain response from scientists and politicians. It is said that the SDI is the way to the development of science, to new heights in scientific and technological progress. But I will tell you that this type of thinking is warped—everything is turned upside down. Can we not make advances in science and technology, every part of scientific knowledge, including the development of new materials, radio electronics, computer technology, mathematics, etc., through

civilian projects? The Veha programme is a recent and convincing example of this. I heard the reports of Academician Sagdeyev and other Soviet scientists who carried out this most interesting project with the participation of their foreign colleagues. They needed new solutions and new materials. These were found. They needed new solutions to the problem of controlling the manoeuvres of a sophisticated craft over great distances. These were developed. They needed a stable radio and TV communication link. This was established. They needed new mathematical discoveries and computations to accomplish such a complex task. These were made. They needed accurate information about the situation on Venus and near Halley's Comet. This was obtained.

Many countries, Western included, participated in the project. Especially fruitful cooperation in that field was achieved with scientists from France.

Now we have come to grips with the problem of developing a dependable source of energy. The problems of energy, like those of food and ecology, are the central, global problems of the future. If there were no projects in the military field, efforts in this peaceful sphere would be making progress at a much faster rate. Recently the Chairman of the Council of Ministers of the USSR, Nikolai Ryzhkov, submitted to the United Nations the Soviet Government's proposals on the development of international scientific cooperation in peaceful uses of outer space.

Thus, advances can be made in science on the basis of civilian projects. The argument that science and technology can be developed only through an arms race is simply absurd. The question to ask then is this: What is the problem? Who,

God perhaps, has taken away the ability to grasp the realities of today's world, of the nuclear-missile space age? These two men (pointing to portraits of Marx and Lenin) taught us that in order to get to the heart of the matter, we must clear the surface of all sorts of rubbish and lay bare the motives and interests behind one position or another.

Whose interests are met by the proposals of political forces, scientists and the public, who are insisting on scaling down the arms race, on starting disarmament and on the eventual elimination of nuclear weapons? I believe these proposals meet the interests of all nations and there are no higher interests.

We realise that a group of countries which would like to use their superior arms arsenals for political pressure might have interests of their own. And there are other interests, I would say, of a lower order. There are the interests of the military-industrial complex, which are also very real. But, first of all, these are not the interests of any nation, let alone human civilisation. And, second, neither civilian research, nor research into energy problems, nor anything else would suffer if military research and war production were stopped. The forces which are involved in the development of weapons today could work fruitfully in civilian areas. Neither science nor the industries currently involved in war production would be left idle. Everyone would only stand to gain.

So, we need a new way of thinking. It is impossible to solve the burning problems of today, let alone of the coming century, if one is to be guided by views characteristic of past centuries, past decades, or, in any case, of times prior to the emergence of nuclear weapons and the recent upsurge in the scientific and technological revolution...

Today it is more important than ever before that politics and science cooperate. Today it is essential that every field of science analyse the political consequences of its discoveries and achievements. And likewise, politics must be based on scientific achievements, on the strict analysis, objective evaluations and predictions offered by science.

I favour the unification of politics and science. Every country stands to gain from such a unification in regard both to domestic affairs and to the solution of the problems which we are discussing today.

From the Speech at the Meeting in the Kremlin on February 16, 1987, with the participants in the International Forum "For a Nuclear-Free World, for the Survival of Humanity"

"Pravda", February 17, 1987

The uniqueness, I might even say the dramatic character, of the situation is emphasised by the threat of the arms race spreading to outer space. If this should happen, the very idea of arms control would be compromised. Distrust, mutual suspicion and the temptation to be ahead in deploying still new weapon systems would increase tremendously. Destabilisation would become a reality and may well bring on a crisis. The risk of an accidental outbreak of war would increase several times over...

I would like to say a few words about the

passions which flared up in recent days about the deployment of a first layer of SDI. The advocates of the deployment insist on a "broader interpretation" of the ABM Treaty. Incidentally, while debates on this subject are going on in Washington and between the NATO allies, the US administration has already officially suggested in Geneva that such an interpretation be formally endorsed. So discussions in this case are not a way of sounding public opinion. This is close to real politics, if not real politics itself. And this should worry all of us. The aim is clearly to wreck the ABM Treaty. From the very start the political and, if you like, philosophic significance of the Treaty has consisted in ensuring stability based on the absence of anti-missile defence and in this way ending the eternal competition between the sword and the shield, which is particularly dangerous in a nuclear epoch. The sides signed the ABM Treaty as a result of a long discussion lasting many years, in which the best minds capable of evaluating the situation took part. At that time the United States admitted that it was the right thing. And now it wants to break down this very important barrier to the arms race by giving it a broad interpretation.

If the Treaty should be annulled, the nuclear missile race would acquire new dimensions and would be accompanied by an arms race in outer space, the inevitable consequences of which I have just mentioned.

In November 1985, President Reagan and I made the following pledge in Geneva: "... to prevent an arms race in space and to terminate it on earth, to limit and reduce nuclear arms and to enhance strategic stability." This is recorded in the joint statement adopted in Geneva. By undermining the ABM Treaty, the US administration shows

scorn for that pledge and for the signature the United States put to that Treaty of unlimited duration 15 years ago.

What the situation requires is stricter observance of international law rather than attempts to undermine it or throw out of it some of its major elements.

Another matter we are considering now is why some countries arrogate to themselves the right to invent and develop new weapon systems which, even if not deployed or used, threaten other countries and peoples? Most likely, you are bound to ask the same question. This problem transcends the boundaries of national sovereignty. It is an international problem.

Or consider another question. At present the national sovereignty of a state extends to the airspace above it. And every state has the right to defend it from intrusion. A far greater threat will come from outer space if weapons are placed there as intended. The aim of such plans is to create a new instrument of blackmail against independent states. Isn't it high time to consider making a ban on the deployment of weapons in space, over the heads of the people in other countries, a part of internationa law?...

At our meeting in Geneva, the US President said that if the earth were threatened by an invasion by extraterrestrials, the United States and the Soviet Union would join forces to repel such an invasion. I will not dispute the hypothesis, though I think it is too early to worry about such an invasion. It is more important to ponder over the problems which are already facing us. It is more important to realise the need to eliminate the nuclear threat and accept the fact that there would be no roof, either on earth or in space, to save us if a nuclear storm broke out.

Our idea of creating a comprehensive system of international security, and our other initiatives clearly show that the Soviet Union is willing and ready to renounce its nuclear power status and reduce all other armaments to a level of reasonable sufficiency.

The USSR does not want anything it would deny others and does not seek an ounce more security than, say, the United States has. However, the Soviet Union will never agree to an inferior status or discrimination against it.

Take all our proposals. There are no weapons of ours that are not subject to negotiations. Our principle is simple: all armaments should be limited and reduced, and mass destruction weapons should be eventually scrapped. Such is our firm position.

References

1. *The Works of Bernard Shaw*, Vol. 10, London, 1930, p. 105.
2. *Moskovskiye Novosti*, No. 31, 1986.
3. S. P. Kapitsa. Nauchitsya dumat po-novomu". *Inostrannaya Literatura, No. 1, 1986, p. 205.*
4. *Times*, July 17, 1985.
5. *Novoye Vremya*, No. 2, 1985.
6. V. S. Yemelyanov. "Dostizheniya nauki—progress ili katastrofa?" A report at the 2nd All-Union Conference of Scientists, May 27, 1986.
7. *Za Rubezhom*, No. 26, 1986, p. 9.
8. *Washington Times*, August 2, 1985.
9. Ralph Waldo Emerson. *Complete Works*, Vol. 1, New York, 1926, pp. 84, 104-105.
10. *Tvorcheskoye naslediye akademika Sergeia Pavlovicha Korolyova.* Moscow, 1980, pp. 69-70.
11. *Novoye Vremya*, No. 38, 1985, p. 4.
12. Robert Bowman. *Star Wars. A Defence Insider's Case against the Strategic Defence Initiative*. New York, 1986, p. 132.
13. *Newsweek*, September 9, 1985.
14. *Science & Government Report*, Washington, 1985, No. 18, p. 1.
15. *Time*, October 7, 1985, p. 50.
16. A TASS report from Washington, May 20, 1986.
17. A TASS report from the United States, February 21, 1985.
18. *Time*, October 7, 1985.
19. *Der Spiegel*, November 25, 1985.
20. G. Menahem. *La science et le militaire*. Paris, 1976, p. 212.

21. F. Barnaby. *Military Scientists*. The Bulletin of the Atomic Scientists. June-July 1981, p. 11.
22. *Wall Street Journal*, March 19, 1986.
23. *Espresso*, July 14, 1985.
24. *Science & Governement Report*, No. 7, 1985, p. 3.
25. *Pravda*, March 24, 1986.
26. *Espresso*, June 16, 1985.
27. *Science & Government Report*, No. 7, 1985, p. 3.
28. *Newsweek*, June 17, 1985.
29. *Novoye Vremya*, No. 19, 1986, p. 5.
30. William J. Broad. *Star Warriors*. Simon & Schuster, New York, 1985, p. 15.
31. *Pravda*, March 24, 1986.
32. *Le Point*, September 16, 1985.
33. William J. Broad. *Star Warriors*. Simon & Schuster, New York, 1985, p. 245.
34. *Pravda*, September 16, 1985.
35. *Pravda*, March 24, 1986.
36. William J. Broad. *Star Warriors*. Simon & Schuster, New York, 1985, p. 44.
37. *Ibid.*, pp. 97, 114.
38. *Ibid.*, pp. 47, 129, 130, 218, 220.
39. *Pravda*, August 1, 1986.
40. *SShA: ekonomika, politika i ideologiya*, No. 6, 1985, p. 28.
41. *Science & Government Report*, No. 18, 1985, p. 6.
42. *Pravda*, September 12, 1985.
43. *Pravda*, October 22, 1985.
44. *Time*, October 7, 1985.
45. *Pravda*, November 5, 1985.
46. *Pravda*, January 5, 1986.
47. A TASS report from Washington, May 14, 1986.
48. *Pravda*, November 22, 1986.
49. *New Scientist*, August 1, 1985.
50. *Za Rubezhom*, No. 36, 1985, p. 6.
51. *Los Angeles Times*, February 17, 1985.
52. *Pravda*, February 22, 1985.
53. *Environment*, No. 5, 1984, pp. 33-37.
54. *Ibid.*, p. 37.
55. *Ibid.*, pp. 36-37.
56. *Newsweek*, June 17, 1985.
57. *Horizont*, No. 11, 1985.
58. A TASS report from Washington, May 20, 1985.
59. *Washington Times*, August 2, 1985.
60. A TASS report from Paris, June 27, 1985.
61. *Science & Government Report*, November 15, 1985, No. 19, p. 4.

62. *Christian Science Monitor*, December 24, 1985.
63. *Za Rubezhom*, No. 36, 1985, p. 4.
64. *Environment* No. 5, 1984, pp. 37-38.
65. *Time*, October 7, 1985.
66. *Pravda*, July 30, 1985.
67. *Pravda*, January 7, 1985.
68. *Los Angeles Times*, February 17, 1985.
69. *Vneshnepolitichesky bulleten MID GDR*, No. 6, 1986, p. 45.
70. A TASS report from New York, December 13, 1985.
71. *Pravda*, September 5, 1986.
72. *Pravda*, July 11, 1985.
73. *Stern*, July 18, 1985.
74. "Udarnye kosmicheskiye vooruzheniya i mezhdunarodnaya bezopasnost". A report of the Committee of Soviet Scientists in Defence of Peace, Against the Nuclear Threat. APN Publishers, Moscow, 1985, pp. 41-53.
75. *Novoye Vremya*, No. 35, 1985.
76. *Newsweek*, June 17, 1985.
77. A TASS report from Washington, March 6, 1986.
78. E. P. Velikhov. "Uchonye protiv ugrozy yadernoy voyny". *Slovo lektora*, No. 4, 1984, p. 23.
79. *Pravda*, June 2, 1986.
80. *Novoye Vremya*, No. 38, 1985.
81. *Pravda*, June 18, 1985.
82. *Washington Post*, September 9, 1985.
83. *Pravda*, November 1, 1985.
84. *Pravda*, August 13, 1985.
85. *Pravda*, August 11, 1985.
86. A TASS report from Washington, September 20, 1985.
87. *Pravda*, August 12, 1985.
88. *Novoye Vremya*, No. 18, 1986.
89. *Pravda*, November 1, 1986.
90. *Pravda*, January 5, 1986.
91. *Novoye Vremya*, No. 30, 1986.
92. *Pravda*, August 21, 1985.
93. *Pravda*, November 22, 1986.
94. E. P. Velikhov. *A report at the 2nd All-Union Conference of Scientists*. May 27, 1986
95. *Pravda*, September 6, 1985.
96. *Pravda*, July 2, 1985.
97. *American Scientist*, No. 5, 1985.
98. A TASS report from Washington, January 30, 1986.
99. *Newsweek*, June 17, 1985.
100. *Pravda*, October 29, 1986.
101. A TASS report from Washington, January 30, 1986.

102. *Pravda*, August 13, 1985.
103. *Pravda*, May 24, 1985.
104. *Pravda*, August 16, 1985.
105. *Pravda*, February 13, 1985.
106. *New Scientist*, September 19, 1985, pp. 30-33.
107. *Pravda*, September 15, 1985.
108. *Pravda*, September 12, 1985.
109. *Pravda*, August 12, 1986.
110. *Vorwärts*, March 1, 1986.
111. A TASS report from Washington, May 31, 1985.
112. *Pravda*, August 27, 1985; *Sovetskaya Rossiya*, October 18, 1985.
113. *Pravda*, November 24, 1985; *Ivzestia*, August 21, 1985.
114. *Izvestia*, August 6, 1985.
115. *Pravda*, July 2 and 30, 1985; *Za Rubezhom*, No. 36, 1985.
116. *Izvestia*, August 9, 1985; *Stern*, July 16, 1986.
117. *Washington Post*, July 29, 1985.
118. *Za Rubezhom*, No. 29, 1985; *Pravda*, January 21, 1986.
119. *Pravda*, January 21, 1986.
120. *Pravda*, November 18, 1986.
121. *Moskovskiye Novosti*, No. 31, 1986.
122. *Pravda*, December 11, 1986.
123. *Bulletin of Atomic Scientists*, No. 9, 1984.
124. A TASS report from Washington, May 31, 1985.
125. *Sovetskaya Rossiya*, October 18, 1985.
126. *Der Spiegel*, November 25, 1985.
127. Daniel Deudney. *Space: The High Frontier in Perspective*. Washington, 1982, p. 55.
128. *Novoye Vremya*, No. 39, 1985.
129. Federation of American Scientists. *Public Interest Report*. No. 6, June 1983.
130. *Pravda*, February 6, 1986.
131. *US-Soviet Cooperation in Space. A Technical Memorandum*. Washington, 1985, p. 3
132. *Kommunist*, No. 5, 1986.
133. *Pravda*, July 13, 1986.

Дмитрий Лужков

ГОМО САПИЕНС И «ЗВЕЗДНЫЕ ВОЙНЫ»

на английском языке

Цена 35 к.

This book is about scientists who have refused a great deal of money and have exposed themselves to much political risk by staunchly opposing President Reagan's Star Wars project. It also tells about scientists working at the Lawrence Livermore National Laboratory in the United States whom William Broad, an observer for *The New York Times,* has called Star Warriors. This book is about both true patriots for whom American security is inseparable from world security and Americans who would like to turn the Soviet Union into a dead wasteland resembling the surface of the Moon. This book is about the responsibility of scientists for preventing our civilisation—a civilisation that has gone from being one of primitive man to one that produces men like Einstein and the conquerors of outer space—from being turned into a desertland covered by weeds and insects.

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